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CANEFIELDS IN NORTH QUEENSLAND.

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Editor: C. W. Winders, B.Sc.Agr.

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Berkshire.

A. P. and N. Beatty, "Deepdene," Baramba road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M State Farm, Numinbah
G. L. Gibinko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud Kingaroy.
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
M. F. Callaghan, Lower Mount Walker, *via* Rosewood
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands" Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie.
D. G. Gravson, Killarney
A. French, "Wilson Park," Pittsworth
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands Rangeville, Toowoomba.
H. H. Sellars, "Allambie" Stud, Beaudesert
E. J. Clarke, Mt. Alford, via Boonah

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen "Bremerside" Stud, Rosevale, *via* Rosewood
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabalah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
O. B. Vidler, Manneum, Kingaroy
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy.
B. F. Jensen, Rosevale
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M. S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crowntborpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale Stud," 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville

Tuberculosis-Free Cattle Herds.

The studs listed below have fulfilled the conditions of the Department's Tuberculosis-free Herd Scheme to 30th June, 1957.

Breed.	Owner's Name and Address.
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
	J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
	Sullivan Bros., "Valera" Stud, Pittsworth
	Reushle Bros., "Reubydale" Stud, Ravensbourne
	H. F. Marquardt, "Chelmer" Stud, Wondai
	A. C. and C. R. Marquardt, "Cedar Valley," Wondai
	A. H. Sokoll, "Sunny Crest" Stud, Wondai
	W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
	G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Grovely," Greenmount
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
	W D Davis, "Wamba," Stud, Chinchilla
	Queensland Agricultural High School and College, Lawes
	C. K. Roche, Freestone, Warwick
	Mrs. K. Henry, Greenmount
	D. B. Green, "Deloraine" Stud, Durong, Proston
	E. Evans, Wootha, Maleny
	T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
	J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
	M. F. Power, "Barfield" Kapaldo
	A. H. Webster, "Millievale," Derrymore
	W. H. Sanderson, "Sunlit Farm," Mulgildie
	R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, via Murgon
	R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
	C. A. Heading, " Wilga Plains," Maleny
	G. S. and E. Mears, " Morden," M. S. 755, Toogoolawah
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
	C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
	G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
	T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
	D. J. Pender, "Camelot," Lytton road, Lindum
	S. E. G. Macdonald, "Freshfields," Marburg
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
	A. C. Swendson, Coolabunia, Box 26, Kingaroy
	C. Scott, "Coralgrae," Din Din Road, Nanango
	R. J. Wissemann, "Robnea," Headington Hill, Clifton
	G. L. Johnson, "Old Cannindah," Monto
	A. Ruge & Sons, Woowoonga, *via* Biggenden
	G. Miller, Armagh Guernsey Stud, Armagh, M. S. 428 Grantham
Jersey	N. H. Sanderson, "Eden Valley," Monto
	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	P. J. L. Bygrave, "The Craigan Farm," Aspley
	R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
	P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
	E. A. Matthews, "Yarradale," Yarraman
	A. L. Semgreen, "Tecoma," Coolabunia
	L. E. Meier, "Ardath" Stud, Boonah
	A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
	W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
	Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
	D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
	J. W. Carpenter, Flagstone Creek, Helidon
	H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
	W. S. Kirby, Tinana, Maryborough
	S. A. Cramb, Bridge St., Wilsonton, *via* Toowoomba
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
	J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
	W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
	T. Nock, Dallarnil
	P. Fowler & Sons, "Northlea," Coalstoun Lakes
	F. Porter, Conondale
	H. M. State Farm, Palen Creek
Polled Hereford ..	B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie
	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla
	D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick
	E. W. G. McCamley, Eulogie Park, Dululu
	Wilson and McDonall, Calliope Station, Calliope
Aberdeen Angus ..	W. H. C. Mayne, " Gibraler," Texas

"Better Feeding of Our Cattle—Will It Pay?"

By D. N. SUTHERLAND, Director of Cattle Husbandry.

At the present time losses caused by drought to the State's livestock industries—particularly the beef and dairy cattle industries—are uppermost in the minds of all people concerned with the welfare of these industries.

Droughts of serious proportions affected the whole of the State in 1946 and 1951 and caused serious economic loss to all livestock industries. The spectacular nature of the losses which occurred in these droughts and the need for measures to combat such losses in the future are matters which receive wide publicity.

However, in our preoccupation with the losses due to periodic major droughts, we tend to overlook to some extent the serious loss in production which occurs every year due to the seasonal nature of our rainfall. The extent of this loss to the beef and dairy cattle has been shown clearly by herd recording data in the dairy industry and by the results of growth rate trials with beef cattle which have been carried out at a number of centres since 1951.

In the years from 1952 to 1956, although rainfall in most of the State's dairying districts was better than normal, the average production of butterfat per cow in production recorded herds did not rise above 155 lb. in any year. This is a low level of production compared with the levels attained in other States of Australia and in overseas countries where dairying is a major industry.

The fact that this low level of production is due to lack of adequate feed of high quality for a large period every year is not disputed by anyone with a knowledge of the conditions in the dairy industry in Queensland. It is also beyond dispute that this low level of production is a major factor contributing to high cost of production of dairy products.

In the years from 1952 to 1956 most of the beef cattle producing areas of the State also enjoyed relatively favourable seasonal conditions. However, at those centres where growth rate trials were carried out to study the performance of beef cattle on unimproved pastures, losses of liveweight were recorded for a considerable period each year because of the poor quality of the feed available. Under these conditions most bullocks do not reach prime condition until they are at least four years old and they do not produce carcases which are suitable for the present requirements of the local and export beef markets.

In both industries, measures required to overcome seasonal shortages of feed are similar—establishment of improved pastures, better methods of pasture management, establishment of crops for grazing when pasture productivity is low, conservation of fodder during periods of flush growth for feeding during the drier seasons of the year, and better control of herds to regulate calving to take advantage of periods of flush growth. It is realised that,

as yet, many of these measures are impracticable in some of our beef cattle areas. However, in southern and central Queensland some of these measures must be adopted by beef producers if we are to produce the type of cattle most sought after for the local and export markets.

While these measures will be effective in increasing production by individual animals, this is not their only advantage. Production on all properties is limited by carrying capacity and this is governed under present conditions by the amount of feed available when pasture productivity is lowest. If improved methods of fodder production are adopted and fodder is conserved for feeding to stock at this time, overall carrying capacity can be increased considerably.

To date, Queensland has lagged behind other States of Australia in adopting methods to improve nutrition of its livestock industries. This has been due largely to the effects of our less favourable environmental conditions and to the fact that much more information has been available on methods of pasture improvement for the temperate environment of the southern States. However, an increasing amount of knowledge has been obtained in recent years on methods of crop and pasture establishment and fodder conservation under Queensland conditions and the application of this knowledge can lead to marked increase in production.

In considering the practicability of adopting these measures, it is likely that if we regard them purely as measures to prevent drought losses, they would be considered uneconomic. However, if they are regarded as measures to raise productivity in favourable years as well as in drought years, they would almost certainly prove to be a sound investment.

GROUP DRAINAGE TO REPLACE LEVEE BANKS.

The need for farmers and local authorities to adopt a constructive approach to the problem of run-off water disposal on the Darling Downs was stressed recently by the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.).

The uncontrolled flow of run-off water in this area has been a serious problem for farmers whose properties are in the path of the main flows. Many farmers have constructed levee banks to protect their properties, but some of these have only aggravated the position. Although the levee banks have diverted water from the protected property, they have increased the flow on adjoining lands.

Recent gazettal of provisions enabling certain local authorities to license levee bank construction will enable these bodies to order the removal of unsuitable structures. However, when this is done, the farmer's original problem still remains—his cultivation is still exposed to the danger of erosion by run-off water.

Mr. Collins said the practical answer to the problem lies in the development of group drainage schemes which are based on a planned approach, taking into account the factors of land utilisation, water flow control and the siting of public roads. Legislative machinery exists for farmers and local authorities to develop and apply group drainage schemes.

A group drainage scheme would first involve the application of soil conservation measures to the upper catchment. This would not only protect the upper catchment farms but would also reduce the amount of silt in the run-off water and have a stabilising influence on run-off. In the lower areas, water disposal outlets could then be defined and would remain stable. On these sections, some change in the system of land use may be necessary to reduce the destructive effects to a minimum. Officers of the Department are moving ahead with a programme to determine the practical possibilities of improved pasturage in these vulnerable areas.

Royal Agricultural Society (Toowoomba) Field Wheat Competition, 1956

By J. HART (Senior Adviser in Agriculture) and C. S. CLYDESDALE (Field Officer, State Wheat Board).

The Toowoomba Royal Agricultural Society conducts a State Field Wheat Competition each year. The object is to stimulate interest in the production of quality wheat through the adoption of recognised sound farming practices. The Society itself gives an immediate lead by limiting entries to a select group of named varieties.

Crops are judged on the basis of the following award sheet.

A. *Apparent Yield.*—(1 point for every bushel up to 30 bus. p.a. Half a point for every bushel over 30.)

B. *Trueness to Type and Purity.*—20 points.

C. *Freedom from Disease.*—25 points.

D. *Evenness of Crop.*—15 points.

E. *Condition.*—10 points.

F. *Freedom from Weeds.*—25 points.

G. *Protein.*—(Two points for every 1 per cent. over 10 per cent. protein.)

The 1956 Competition is the first in which points have been allocated for grain protein. This allocation virtually disqualifies from the prize-winning list any entry with a protein content of less than 10 per cent., such is the importance attached to this characteristic.

WINNERS OF 1956 COMPETITION.

For the purpose of the competition the State is divided into five zones (see Plate 1).

Zone 1 comprises the shires of Jondaryan and Rosalie.

Zone 2 comprises the shires of Cambooya, Clifton, Millmerran, Pittsworth, Allora, Glengallan, Inglewood and Rosenthal.

Zone 3 comprises Wambo shire.

Zone 4 comprises the areas west of Wambo shire and south of the Great Dividing Range.

Zone 5 comprises the South, Central and Upper Burnett, the Dawson, Callide and Central Highlands districts.

In the 1956 competition, insufficient entries were received from Zone 5 to warrant judging within this zone. Entries were judged within the other four zones. In the discussion sections, certain comparisons are made between different varieties and different treatments. For this purpose, consideration has been restricted to Zones 1, 2, and 3, because (*a*) these three zones provided the bulk of the State's crop, and (*b*) the soil types within these three zones are comparable. In Zones 4 and 5, some of the soil types differed considerably from those of the other three zones, and climatic influences were also less constant.

The winning crops of the 1956 Competition (excluding Zones 4 and 5) were as follows:—

Grand Champion.

Tyson and Crank, Oakey. Variety, Festival. Yield 44 bus.p.a.

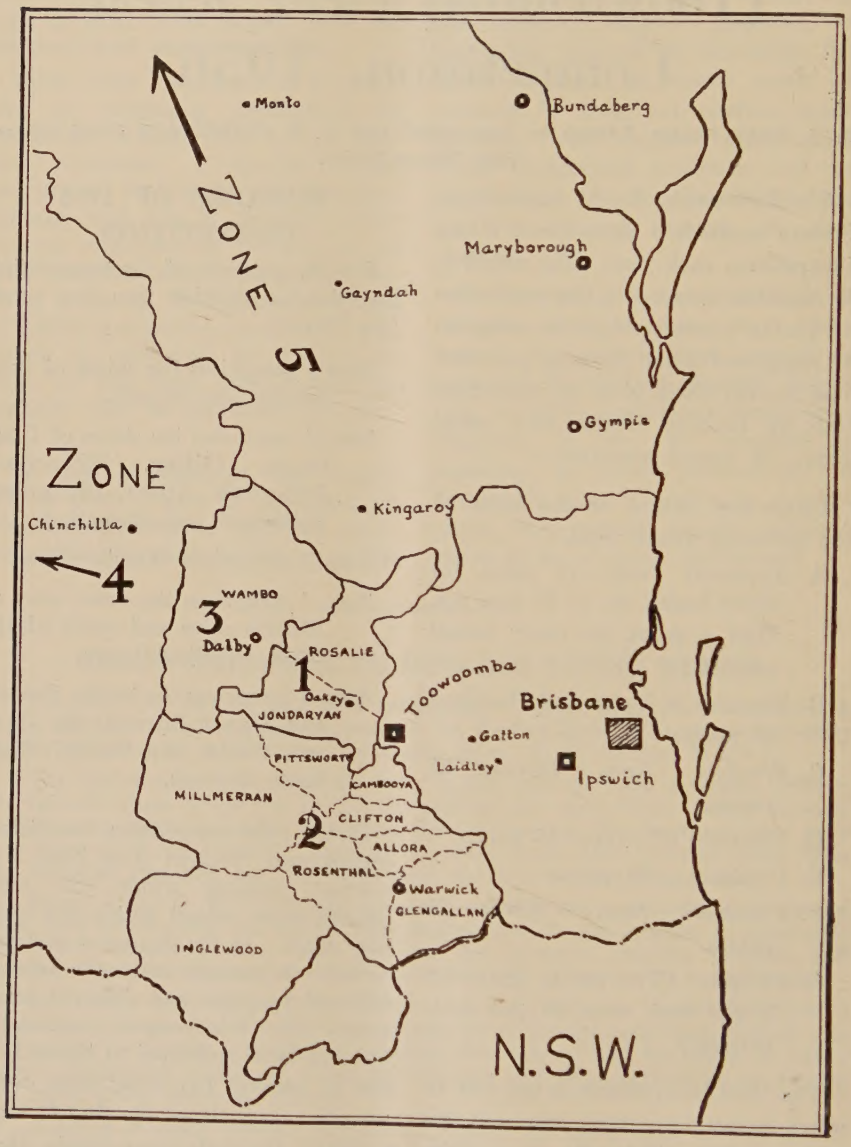

Plate 1.

Sketch Map of South-Eastern Queensland, Showing Zones of Wheat Crop Competitions. Zones 1, 2 and 3 are shown in detail, and the relative positions of Zones 4 and 5 indicated.

Reserve Champion.

K. and A. J. McIntyre, Jondaryan. Variety, Spica. Yield, 40 bus.p.a.

Zone 1.

—	First.	Second.	Third.
	Tyson and Crank, Oakey.	K. and A. J. McIntyre, Jondaryan.	A. F. McWilliam and M. E. Coleborn, Bowenville.
	Festival.	Spica.	Lawrence.
A ..	37·0	35·0	37·0
B ..	19·0	19·5	18·0
C ..	21·5	20·0	22·5
D ..	13·0	13·0	13·5
E ..	7·5	8·5	8·0
F ..	24·0	24·0	22·5
G ..	7·4	6·0	3·4
Total	129·4	126·0	124·9

Zone 2.

—	First.	Second.	Third.
	R. W. Coutts, Cecil Plains.	M. J. Anderson, Pittsworth.	L. A. and J. S. Dowling, Inglewood.
	Festival.	Spica.	Festival.
A ..	36·5	37·0	36·0
B ..	18·0	17·0	18·0
C ..	22·0	21·5	23·5
D ..	14·0	12·5	13·0
E ..	8·0	7·5	7·0
F ..	22·0	24·5	19·0
G ..	4·0	2·6	5·2
Total	124·5	122·6	121·7

Zone 3.

—	First.	Second.	Third.
	G. Jensen, Jimbour.	J. A. . . J. and W. M. Bell Dalby.	Crowther and Co., Glenmorgan.
	Festival.	Festival.	Charter.
A ..	35·0	33·0	35·5
B ..	17·5	17·0	17·5
C ..	21·0	22·0	22·0
D ..	12·5	13·0	13·0
E ..	8·0	8·0	7·5
F ..	22·0	24·0	20·5
G ..	8·4	7·0	2·4
Total	124·4	124·0	118·4

Apart from the Grand Champion crop, which recorded the highest points in the field judging, most other prize entries forced a winning margin through their protein percentages. This satisfies one of the prime objects of the R.A.S. Field Competition—namely, to stimulate and maintain interest in the production of quality wheat.

Due to low grain protein percentages, many fine crops did not show up in the final placings. Growers of these crops will be anxious to know the reason for their poor protein analysis. Although this does not come within the scope of the report, some attempt is made in a later section to sort out the background of high and low protein entries.

POINTERS.

As in previous seasons, crop data supplied by entrants have been examined in the light of competition results. It is emphasised that such data can only give a very broad picture of field influence, but a comparison of farming techniques may, at least, provide pointers for future consideration.

Points gleaned from the data for Zones 1, 2 and 3 are presented below under the relevant headings.

Yield.

The average varietal yields of the predominant varieties were as follows:—

Spica	.. 38.7 bus.p.a.
Festival	.. 38.3 bus.p.a.
Charter	.. 37.7 bus.p.a.
Lawrence	.. 36.0 bus.p.a.

In spite of the dry seasonal conditions, crop yields were remarkably high. Many 42 bus.p.a. crops were grown without effective rain after germination.

Overall, there was no significant yield difference between Spica and Festival, despite consistently lighter stands of the former variety. In this

Plate 2.

The Reserve Champion Crop of Spica Wheat Entered by K. and A. J. McIntyre, Jondaryan. The group comprises Messrs. C. S. Clydesdale (judge), K. McIntyre (competitor), J. H. Anderson (representing Royal Agricultural Society), L. White and N. Smith (visitors).

Plate 3.

The Competition Crop of Festival Entered by Mr. E. Flegler, Irongate. Mr. Flegler has been a consistent performer in these competitions. In the group are Messrs. A. F. McWilliam (R.A.S.), C. S. Clydesdale (judge), E. Flegler (competitor), H. Colbert (R.A.S.) and J. H. Anderson (R.A.S.).

connection, it might be mentioned that Spica is generally regarded as a grain giving lower field germination than other varieties. The reason for this is not clear, although it may be due to some grain damage resulting during the harvesting of this "tough to thresh" crop.

Lawrence, though an excellent commercial variety, is not a good competition wheat, as it lacks the yielding capacity of some other available varieties.

Although moderate variations in wheat plant populations appear to have little influence on grain yields, growers could give consideration to increasing their standard sowing rate by at least 5 lb. per acre in the case of Spica.

Despite the abnormal pre-planting rains, long-fallowed areas again outyielded the short-fallowed, with average yields of 40 bus.p.a. for the former and 38.1 bus.p.a. for the latter. In the 1955 competition the differences were even more marked, with long-fallow crops averaging 40 bus.p.a. and short-fallow 35.6 bus.p.a. In this connection, a "long" fallow is one of 12 months or more, while a "short" fallow is one of approximately 6 months between successive winter crops.

As indicated in last season's competition results, age of cultivation appears to have had little effect on overall grain yields.

Trueness to Type and Purity.

With few exceptions, entries rated higher in this category than in previous competitions.

As the competition closing date invariably falls prior to or during the early crop flowering stage, would-be competitors have little chance of assessing the varietal purity of their crops before entering them. This provision brings home clearly to competitors the value of using a reliable seed stock with a high degree of varietal purity.

This point is further emphasised by the fact that the Reserve Championship crop was grown from *Mother Seed* supplied by the State Wheat Board.

Growers are urged to take advantage of the Wheat Board's Mother Seed Scheme. At the moment this does not cover all varieties but within a short period a good range of local varieties will have been included.

Incidence of Disease.

Almost every crop in Zones 1 to 3 was affected to some extent by crown rot (*Fusarium graminearum*). Its occurrence followed no logical pattern. In some instances infection was severe, but generally the incidence was insufficient to affect crop yields to any great extent. Nevertheless, in the course of judging, losses estimated as high as 40 per cent. were observed in some non-competition crops.

The incidence of crown rot can be reduced to a minimum by:—

(1) Crop rotation and ley farming.

(2) Sowing only heavily graded, full, plump seed from a disease-free source.

(3) Treating seed at 2 oz. per bus. with an approved mercurial dressing.

(4) Maintaining soil fertility at a high level.

(5) Avoiding lowlying land.

The overall points gained in this section of the competition were reasonably high. This was largely due to the very low incidence of stem rust. Leaf rust, also, was particularly light in many instances. A low incidence of stem rust, however, must be regarded as the exception rather than the rule. Therefore the more rust-resistant varieties, Spica, Lawrence and Festival, should still constitute the major sowings, particularly on the Darling Downs and in near-coastal districts.

The usual amount of loose or flying smut was recorded, but neither bunt nor flag smut was noted in any entry. This may have been quite accidental, but freedom from bunt did coincide with a marked increase in the number of entries adopting recognised seed treatment practices. In the 1955 competition, 48 per cent. of entrants failed to apply effective seed treatment measures. This season the figure was reduced to 28 per cent.

As a result of a general freedom from stinking smut (bunt) over the past years, many growers have become forgetful of its harmful effects. In addition, many of the younger generation are totally unfamiliar with the disease. It should be remembered that it is a serious disease which can cause heavy economic losses. Fortunately, control can be guaranteed through effective seed dressing.

Weed Growth.

The 1956 season did not favour excessive weed growth. Many entries scored heavily in this section, some earning 24½ out of 25 points.

A rather general dockage was that made for wild oats. The infestations ranged from a trace to heavy. The widespread occurrence of this pest in 1956 points to its fast becoming a very real menace to the wheat industry in established areas. Wherever possible, badly infested areas should be laid down to pasture until such time as the oat seed dormancy is broken or the seed destroyed.

Crop Condition.

As usual, points were allocated for crop "finishing ability." Despite the dry growing period, most entries finished well. Under such seasonal conditions this could happen in few, if any, other areas of Australia.

Under this heading some growers also lost points for crop frost injury. Many growers are unaware of the complete picture of frost injury symptoms. In addition to the more noticeable head frosting, stem damage had also reduced cropping potential. Typical symptoms, such as buckling of the plant stems or a swelling and blistering of the nodes accompanied by a stem silvering, in many cases indicated that cold had upset the normal functioning of the plant tissue.

Protein Percentage.

Protein determinations were arranged by the Chemical Laboratory of the Department of Agriculture and Stock, Brisbane.

The average protein percentage of all field crop entries was 11.6 per cent. at 13.5 per cent. moisture.

In examining this figure, full account must be taken of record flood rains, which not only depressed nitrification but most likely caused serious leaching of soil nitrogen. When it is considered also that the protein figure ties in with an overall average yield of approximately 38 bus.p.a., then a mean of 11.6 per cent. must be regarded as very satisfactory.

For the benefit of competitors, the average protein trends in relation to fields in this competition appear to be as follows:—

—	—	Protein Per cent.
Age of Cultivation ..	0–5 years ..	11·7
	6–10 years ..	12·1
	11 + years ..	10·8
Land Treatment ..	Long Fallow ..	11·8
	Short Fallow ..	11·3
Grain Yield ..	Up to 39 bushels per acre	11·4
	Over 39 bushels per acre	11·8

The slightly higher protein content of the heavier yielding crops does, perhaps, suggest that sound farming practices can result in better returns of both total grain and its protein content. Although these data may give only a sketchy picture, the drop

Plate 4.

Harvesting the Competition Crop of Lawrence Wheat on C. B. and L. N. Bazley's Farm, Tipton.

Plate 5.

The Royal Agricultural Society's Crop Competition Exhibit at the 1956 Toowoomba Show. In this exhibit, wheat sheaves and bushel grain samples from competition crops are shown.

in protein on the older cultivation suggests that care must be taken if we are to safeguard our reputation for producing high quality wheat.

The surest way of preserving or restoring soil structure, nitrogen, and general fertility is through bringing balanced pastures into our crop rotation.

General.

(a) Crop Rotation.

When inspecting the championship crop of Messrs. Tyson and Crank, an obvious crop difference was noted between the competition area and the crop in the adjoining portion of the paddock. Both areas had had identical land preparation and crop treatment during the past year. In tracing the land history of the 9-year-old paddock, the only difference occurred some four years previously, when a crop of grain sorghum replaced the usual wheat crop on what was now the 1956 competition area. Prior to this, and also for the subsequent three seasons, both areas have been treated as one.

Mr. Tyson has since advised of a yield difference of 9 bus.p.a. between the two areas, the difference favouring the competition area.

In an endeavour to further probe this crop rotational effect, land treatment histories of other entries were investigated. It was found that where wheat (or allied crops such as oats and barley) had been sown continuously for the past 5 years, the average grain yield was 37.5 bus.p.a. Those areas where some form of crop rotation had been practised during this period gave an average yield of 39.6 bus.p.a.

No one would suggest grain sorghum, setaria (millet), linseed, &c., to be ideal wheat rotational crops. Yet, apparently as a result of rotation with such crops grain yields have been kept at a higher level than in areas growing wheat continuously. This leads to the speculation, What would have been the yield and protein figures had a more favourable rotation, embodying legumes and pastures, been used?

From the foregoing it would appear that to incorporate a balanced pasture as part of the crop rotation is as essential to the wheat industry as is the continued development of high-yielding and rust-resistant varieties.

(b) Stubble Treatment.

Those responsible for the competition were again anxious to collect evidence on the effect of stubble treatment on crop grain yields and protein content.

Unfortunately, this aspect was completely clouded in 1956 through the fact that most entrants who returned the stubble utilized the long fallow. Accordingly, comparisons between stubble retention and stubble burning would be unreal. Increases credited to stubble retention could well be attributable to the beneficial effects of long fallowing.

During the 1955 season, however, the issue was not in doubt. The figures for that season were:—

Ploughed stubble—38.1 b.p.a. average yield.

Burnt stubble—37.3 b.p.a. average yield.

These figures suggest that there is nothing to lose through stubble retention practices—and there is certainly much to gain through better soil protection.

(c) Varieties.

The varietal table below indicates little change in the Queensland varietal position between 1955 and 1956.

(d) Consistency in Competitions.

It is felt that some comment should be offered on the consistency of the standards reached by a number of the entrants in these competitions.

FIELD CROP COMPETITION—VARIETAL TABLE.

Number of Entries.

—	Zone 1.		Zone 2.		Zone 3.		Zone 4.		Total.	
	1955.	1956.	1955.	1956.	1955.	1956.	1955.	1956.	1955.	1956.
Festival ..	29	10	*	12	9	10	5	4	43	36
Spica ..	19	13	..	4	9	3	2	1	30	21
Lawrence ..	13	6	..	1	..	..	..	..	13	7
Charter ..	3	3	..	2	4	3	2	4	9	12
Gabo ..	5	2	..	2	..	1	..	1	5	6
Celebration	3	1	..	1	2	..	..	..	5	2
Seafoam ..	3	1	..	..	1	..	1	..	5	1
Puora ..	..	..	..	..	2	1	..	..	2	1

* No competition in Zone 2 in 1955.

A winning crop, of course, is always a good crop. However, there are occasions in which chance may well play an important part in throwing the balance in favour of one or another good crop.

These competitions were designed to encourage and to help in publicising sound farming practices. One of the best indications of the adoption of such practices comes from the entrant who is consistently awarded high (but not necessarily winning) points. Over the past three years the following are all worthy of mention as falling within this group:—

Messrs. Perrin and Robinson, Dalby.

Messrs. McWilliam and Coleborn, Bowenville.

Mr. L. C. Teakle, Jondaryan.

Mr. R. B. Teakle, Jondaryan.

Mr. B. D. Teakle, Jondaryan.

Mr. L. A. Peters, Bongeen.

I. E. & O. McIntyre, Jondaryan.

Mr. E. Flegler, Irongate.

Mr. K. H. Andrews, Dalby.

Bailey and Co., Pittsworth.

E. W. and A. C. Topp, Condamine.

ACKNOWLEDGEMENTS.

We would like to acknowledge the assistance given to us by Mr. Harold Colbert (R.A.S. Secretary) and his staff, and the consideration and kindness shown us by all competitors.

QUEENSLAND POCKET YEAR BOOK.

The Government Statistician has just issued the Queensland Pocket Year Book for 1957.

This is a small reference book of Queensland statistics, providing the latest available statistical information on a wide variety of matters.

Copies may be obtained from the Government Statistician, 42 George Street, Brisbane, for sixpence each (ninepence posted).

Pasture Improvement Pays at Bowen

By N. E. GOODCHILD, Senior Adviser in Agriculture.

The tropical legume centro (*Centrosema pubescens*) has once again shown its capacity for increasing the productivity of Queensland coastal pastures by its performance on Mr. J. Willcox's farm in the Bowen Delta.

The normal method of using centro in Queensland is to grow it in association with a vigorous grass such as guinea grass, green panic or para grass.

Another method was used successfully on Mr. Willcox's property, where 10 acres of centro-Sudan grass mixture were established in July, 1955.

Seasonal Conditions.

The seasonal pattern in this area is characteristic of the tropical coast. A fairly reliable wet season during the January, February and March period with erratic rain in December produces an average of just over 28 in. of rain, out of a total of about 39 in., which is the average annual rainfall for Bowen. February and March are usually the wettest months. The winter and spring are relatively dry.

Plate 1.
Centro Pasture Being Grazed by Dairy Cattle.

It will thus be seen that centro is able to adapt itself to a wide range of rainfall conditions as it also does well in the 100-150 in. rainfall belt of the far north coast.

Farm Description.

The farm of 160 acres is covered mainly with common couch and salt-water couch, with a scattered stand of guinea grass, para grass, Townsville lucerne and phasey bean.

There are 16 paddocks of 10 acres each, one of which was planted to the Sudan grass-centro mixture.

Establishment.

A seed mixture of 8 lb. of Sudan grass and 1½ lb. of centro per acre was planted in rows 3 ft. apart on 10 acres of cultivation on the heavy black soil of the delta country during July, 1955. Planting depth was 1-1½ in.

The Sudan grass, which germinated quickly, was ready for grazing within six weeks. Centro was much slower in becoming established and did not provide a complete ground cover until February, 1956.

Why this Mixture?

The Sudan grass was used in the mixture to provide much-needed grazing during the September-December period in 1955 because the natural pasture was in short supply. The heavy floods of late March had left a layer of silt over the pastures from which they had not fully recovered. The dry spring and early-summer months further delayed recovery of the native pastures.

Meanwhile the centro was establishing itself in readiness for the wet season.

If a spring and early summer fodder crop were not required, the centro could be sown alone in December to give complete ground cover and ample bulk for grazing by the end of March.

It is possible that a guinea grass-centro mixture would also do as well in this area.

Method of Management.

The Sudan grass was heavily grazed during the August-December period, but it was killed out by the excessively wet soil conditions during the wet season. Stock were removed from the area during February and March to prevent damage to the centro by trampling and this permitted a heavy bulk of green matter to develop.

The 10-acre paddock was subdivided into three areas of approximately 3⅓ acres each.

Each small paddock of centro was grazed in rotation, using a system of 7 days on, with 14 days spell. The herd (average size 45 cows) was given 1-1½ hours' grazing per day, at the end of which time the cows had ceased feeding steadily.

Under this system the centro paddocks provided daily grazing from April, 1956, to the beginning of the wet season in December. Recovery after grazing was rapid even during the late winter. Before each grazing cycle began the centro had produced a dense ground cover of leafy material to a height of 6-9 in.

The cows were turned out from the centro on to the native pasture paddocks each day. These 15 paddocks, which provided the bulk roughage, were also grazed rotationally for 3-5 days at a time.

Improved Production.

Milk production from 45 cows was increased by 10 gallons per day and maintained at this level while they grazed on the centro. This represents a 20 per cent. increase in production and is worth an additional £2 per

day (gross). No concentrates were fed other than molasses provided as a lick in the bails.

What Is the Cost?

The seed for this paddock cost about 10s. 8d. per acre for Sudan grass and 9s. 8d. per acre for centro, or a total of £10 3s. 4d. f.o.r. Brisbane for the 10 acres.

Cultivation costs are estimated at £1 per acre, or a total of £10, and the light subdivisional fencing at contract prices is valued at £15.

The total cost for the pasture, excluding the previously existing fences, is therefore approximately £35.

On the basis of experience with centro in North Queensland the pasture at Bowen should be productive for a period of at least five years, so the cost of establishment could be spread over this period, reducing the annual charge to £7.

Maintenance costs with this type of pasture are negligible.

What Is It worth?

This pasture mixture provided much-needed grazing from the Sudan grass during the August-December period in 1955 and the centro gave a daily increase in milk production worth £2 from April to August in 1956. This increased milk yield had a total gross value for this period of £306.

Production figures from August, 1956, to December, 1956, are complicated by the inclusion of a newly sown Sudan grass paddock in the grazing cycle. This period is therefore not included in estimating the increased yields due to the use of centro.

As mentioned previously on the basis of experience with centro in North Queensland, the pasture at Bowen should be productive for a period of at least five years and should provide grazing for approximately 270 days per year.

What Does the Farmer Think?

The results have been so promising that Mr. Willcox planted a further 20 acres to Sudan grass and centro in 1956. This will be managed on the same pattern as before, and either the cows will be able to have longer grazing periods on the centro or Mr. Willcox will be able to carry more stock.

It certainly looks as if centro has again shown its value as a coastal pasture legume.

ARTESIAN BORES IN QUEENSLAND.

The following figures summarise the position as at 30th June, 1956:—

Total number of bores drilled	2,482
Total depth drilled	3,537,000 ft.
Number of bores flowing	1,579
Daily flow (estimated)	212,000,000 gallons

Growth Cracks in Tomatoes

By I. S. WILSON, Adviser in Horticulture.

Growth cracks are a common defect in commercial tomato crops. They occur in the fruit of all varieties to a greater or lesser degree under certain environmental conditions.

When they radiate from the corky tissue at the stem end of the fruit, they are termed radial or star cracks. When they develop in concentric rings around the shoulders of the fruit, they

Plate 1.

Fruit with Typical Growth Cracks. Upper left, ring cracks; upper right, radial cracks; below, normal fruit.

are known as ring or circular cracks. In fruit which is severely affected by ring cracking, adjacent deep cracks may be joined together by smaller cracks which give a netted appearance to the skin.

Cause of Cracking.

Fruit cracking is fundamentally due to lack of balance in the water relationships of the plant and is normally associated with sharp variations in the moisture content of the soil as the fruit matures.

Ring cracking is most pronounced in fruit which has grown to near-maturity under relatively dry conditions and is then subjected to hot, wet weather in the final stages of development.

Tomatoes which are so placed in the fruit cluster that water from rain or dew lodges in the stem end cavity tend to crack radially. This follows the absorption of water into the corky tissues of the cavity and the corky spots on the skin. It sometimes appears as if radial cracks follow creases on the surface of the fruit which lie immediately above the locules of the flesh. The skin in these creases is relatively thin and apparently susceptible to fracture.

Although skin cracking in the tomato can invariably be traced back to changes in the moisture intake by the plant, this is not the whole story. Nutritional upsets (for example, those associated with acute boron deficiency in the soil) are sometimes contributory factors.

Susceptibility.

Differences in susceptibility of varieties and strains of tomatoes to skin cracking are appreciable. Under conditions which are conducive to the disorder, deep globe varieties such as Grosse Lisse tend to ring crack before the flat-ribbed types such as Rouge de Marmande. Conversely, the ribbed types are more prone to radial cracking than the globe types. There are, however, some exceptions to this generalisation—for example, Marglobe and Rutgers, which have globe-shaped fruit, may suffer from severe radial cracking at times.

When conditions favour skin cracking in the fruit, no variety can be classed as completely resistant. Growth cracks have been observed in all but very immature fruit and increase in severity with the stage of ripeness at which it is harvested.

The position of the fruit on the plant has a bearing on the incidence of growth cracks. Radial cracking, for example, is most pronounced on the lower fruit clusters, and in clusters which develop later the defect is more common on the larger fruit nearest the stem.

Tomatoes on well foliaged plants are less prone to ring cracking than those which are exposed to dew or rain and this type of blemish is therefore normally associated with light, open-foliaged plants. This effect has been demonstrated in experiments which showed that artificial shading of the plants reduced fruit cracking and substantially increased the amount of first quality fruit harvested. The well-known observation that cracking is more severe in fruit from tomato plants which are pruned to a single stem than on non-pruned plants may be another example of the same phenomenon.

Effect of Cracking.

Regulations under the Fruit and Vegetable Act of 1947 prohibit the inclusion of fruit showing skin cracks under an A grade label. Some tolerance is allowed in B grade labelled packs but this is limited to fruit with (*a*) ring cracks which are not more than skin deep and extend not more than 15 per cent. over the surface of

Plate 2.

Flood Irrigated Tomatoes at Bowen. Growth cracks seldom cause heavy losses in irrigated crops.

the fruit, and (*b*) radial cracks which are not more than skin deep and extend not more than one-half inch from the stem end. Fruit with more than the stipulated amount of blemish is virtually unmarketable.

If weather conditions are conducive to skin cracking prior to the main pick in a commercial crop of tomatoes, heavy financial loss is inevitable. Blemishes of this kind are sometimes responsible for as much as 90 per cent. of the fruit being discarded in the field and in the packing shed.

Skin cracks frequently occur after periods of heavy rainfall and high temperatures. Such conditions are favourable for secondary infection by fungal and other disease organisms. Even though the fruit may show no tendency to "weep" when packed, the risk of breakdown in transit to market is considerable; fungi have already gained access to the flesh of the fruit and soft rots develop very quickly.

Control.

As growth cracks are usually associated with the irregular development of the fruit, control depends largely on the grower's ability to maintain a uniform supply of soil moisture to the tomato crop. This presumes efficient soil drainage to reduce the risk of waterlogging in periods of excessive rainfall and, conversely, well-timed applications of irrigation water when the rainfall is insufficient to supply the moisture requirements of the growing plant. Where irrigation facilities are not available, conservation of soil moisture by mulching and effective weed control is helpful.

In non-irrigated crops, wet weather can sometimes be anticipated—for example, at Stanthorpe, where planting takes place before the onset of the normal wet season. Prompt harvesting of all green mature fruits from the plants may then save a large proportion of the crop which would otherwise

be lost; cracks do not develop in the fruit after it is picked.

Cuticle Blotch.

Cuticle blotch is a form of skin cracking in which innumerable shallow circular cracks are arranged concentrically round the shoulders of the fruit near the stem end. Shrivelling of the skin causes these minute cracks to fuse together and produce a discoloration which is known as shoulder or cuticle blotch. It can occur after the fruit is packed and consigned to market and may considerably reduce the value of the fruit.

INCREASED FEES FOR SEED TESTING.

Farmers' Samples for Sowing Still Free.

An amendment to the Agricultural Standards (Seeds) Regulations provides for an increase in fees for seed testing undertaken by the Standards Branch of the Department of Agriculture and Stock on samples of seed intended for sale.

The present fees, which have not been increased since the institution of this service in 1914, bear no relationship to the change in money values since that time nor to the present-day costs of performing seed tests. The new fees are still very reasonable for the amount of work involved and compare more than favourably with those charged in other States of the Commonwealth and New Zealand.

The new fees, to come into effect on July 1, 1957, are as follows:—

Grass Seeds	10/- per sample
Vegetable Crop Seeds	2/- per sample
Other Seeds	5/- per sample

A rebate of 5 per cent. will be credited to those seed sellers who pay a deposit of £5 in advance each financial year and submit, during that year, sufficient samples to exhaust this amount at the rates specified.

There will be no change in the long-standing practice of examining, free of charge, samples submitted by farmers representing seed to be sown on their own properties.

During the last 12 months, 6,736 samples of seed were analysed on behalf of seed merchants, which is an indication of the appreciation with which this service is regarded by members of the seed trade. The increased rates will enable this service to be continued without any curtailment of efficiency or reduction of staff, and the same prompt attention will be given to all samples submitted.

Tomato Pest Control

W. A. SMITH, Entomologist.

For the successful production of tomatoes, protective measures are required against insect and other pests in both the seedbed and the field. Several species are involved and growers are seldom faced with the simple problem of controlling a single pest. For economy in labour and materials, a basic programme should be followed for the control of the major pests, with special applications for others when these occur and are not checked by the usual treatments.

Common Pests.

The tomato grub and the tomato mite are two major common pests. The *tomato grub*, the caterpillar stage of the Heliothis moth, may be active from the time of first flowering. Grubs hatching from eggs laid on terminal shoots feed on the blossoms and tunnel into fruit. The minute *tomato mite* feeds on stem and leaf surfaces, making these shiny and bronzed; damaged leaves later turn brown and die. Mite infestations begin low on the plants and spread upwards to other parts. Breeding and damage develop rapidly in warm weather.

Root-knot nematode is of general occurrence, and, especially in sandy soils, may cause root galling on seedlings or older plants with loss of plant vitality.

Other Pests.

Cutworms, pests of seedlings and transplants, are caterpillars which shelter beneath the soil surface during the day and chew through the soft plant stems at night. *False wireworm* larvae and the parent dark-grey, oval, soil-inhabiting beetles congregate after the "spot" watering of transplants, and can also cut down young plants.

Jassids are small, light-green leafhoppers which, when disturbed, fly rapidly amongst the foliage. Their feeding produces white flecks in the leaves, and large populations cause foliage wilting.

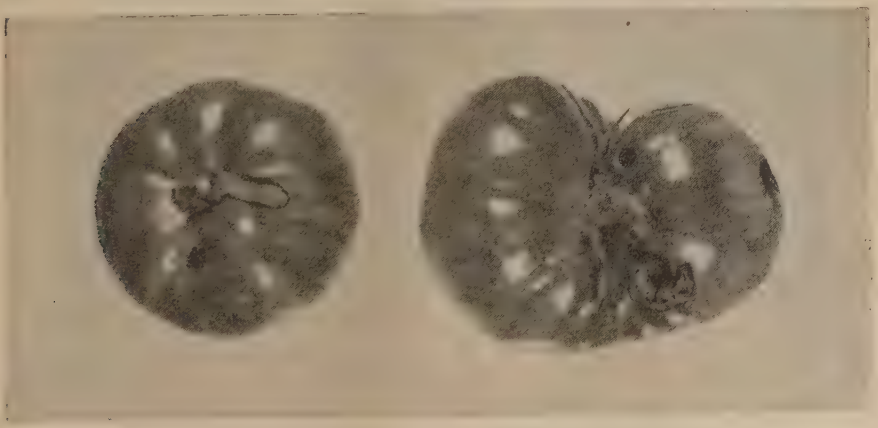

Plate 1.

Tomato Fruit Infested with Tomato Grub.

Plate 2.

Tomato Mites Greatly Magnified.

Green loopers are leaf-chewing caterpillars which occasionally occur in numbers sufficient to strip plants and damage fruit. Young *cluster caterpillars* hatching from egg batches on the foliage cause localised leaf destruction.

A number of bugs, including the *green vegetable bug,* other *shield bugs* and *Rutherglen bugs,* may spot the fruit and wilt terminals by their sap-sucking method of feeding. The *mirid bug* raises swellings at the feeding points on young stems.

Flower *thrips* are thought to be responsible for some faulty fruit setting and blossom-end blemish. *Aphids* breed in colonies under leaves and on terminals, distorting the growth.

Fruit flies may sting green or ripe fruit but are usually pests in commercial crops only during summer, when growth cracks and other fruit blemishes are more prevalent.

Grasshoppers may move from nearby weeds or grassland and feed on seedlings or field plants. *Red spider mites* damage the under surface of the leaf. *Potato tuber moth* larvae tunnel in leaves, shoots and the stem end of fruit.

Control of Pests in Seedbeds.

Regular treatment with sulphur in spray or dust form will protect plants from early infestations of tomato mite. Lead arsenate should be included if leaf-eating caterpillars are present, but spraying with DDT dispersible powder will be required if cutworms or sucking insects appear. Seedbed firing by wood burning, or fumigating with EDB, DD or methyl bromide, before planting will help to ensure nematode-free seedlings. Grasshoppers can be reduced by spraying sur-

rounding paths and vegetation with dieldrin, but gauze screens may be required to exclude these pests from the beds.

Routine Protection of Field Plants.

Combined sprays or dusts containing DDT and sulphur, used monthly in the cooler months or more frequently in warm months, will control tomato mite, tomato grub, jassids and many of the other pests. In districts from Rockhampton north, tomato mite control in the warm months may require an application of dusting sulphur between fortnightly treatments with combined spray or dust.

Control Methods for Occasional Pests.

Green looper infestations are not readily checked by DDT, and spraying with dieldrin or endrin is needed.

For the control of *cutworms* and *false wireworms* the spray or dust containing DDT should be directed to the base of the plant stem and the adjacent soil.

If *green vegetable bug*, other *shield bugs* or *Rutherglen bugs* are active, sprays of double strength DDT emulsion will be required.

Aphids and *thrips* may require a nicotine spray or dust if routine control applications prove ineffective.

Plate 3.

Tomato Fruit Exposed by Destruction of the Lower Leaves by Tomato Mite (Bowen District).

Plate 4.

Nematode Galls on Tomato Roots.

Trouble from *fruit fly* can best be stopped by additional DDT sprays.

The necessity for control of *root-knot nematode* in the field is usually decided from experience. Where the pest is known to be a factor limiting yields, fumigation with EDB or DD before planting is justified.

Materials.

Sprays and Dusts.

The following materials and concentrations are recommended for tomato pest control:—

DDT.—Used alone or in combined sprays, containing 0.1 per cent. active ingredient, or 0.2 per cent. if required.

Dusts containing 2 per cent.

Dieldrin.—Sprays containing 0.05 per cent. active ingredient.

Endrin.—Sprays containing 0.05 per cent. active ingredient.

Sulphur.—Used alone or in combined sprays, containing 2–4 lb. (per 100 gal.) of dispersible (wettable or colloidal) sulphur, according to label directions.

Dusts containing at least 30 per cent. finely ground sulphur.

Nicotine.—Sprays containing 1 in 640 of nicotine sulphate plus an activator (2½ lb. soap or soft soap per 50 gal.).

Dusts containing 5 per cent. nicotine.

Soil fumigants and application methods.

EDB (12½ *per cent. v/v*) *or DD.*—*In seedbeds* inject 2 c.c. of the liquid in positions 9 in. apart at

Plate 5.

Tomato Fruit Attacked by Green Looper.

a depth of 6 in., closing the injection holes immediately. This must be done at least two weeks before seeding.

In the field the area to be treated should receive 20 gal. per acre in lines 1 ft. apart (¼ pint per chain in each line) or at the same line rate in 2 lines along the future row position. The liquid may be injected at 1 ft. spacing, or continuously run in behind a tine or plough, when covering with 6 in. of soil is essential. This fumigation should be done at least two weeks before planting out.

Methyl bromide.—Use 1 lb. per 100 sq. ft. of *seedbed* surface. Gas-tight soil covers of plastic or other material are essential. Covers should be left on for 24 hours and seeding can then be carried out after a further 24 hours. Soil should be loose and moist.

Health Risk.

A health risk is involved in the use of insecticides and related materials. Care should be taken to avoid inhaling these or being unduly wet by spray. EDB, DD and methyl bromide are skin irritants and fumes of EDB and methyl bromide in a poorly ventilated room are dangerous. Splashes of chemical concentrates should be washed off immediately with soap and water and any clothes which are splashed should be changed immediately and not worn again until these have been washed. Note warnings and antidotes on containers.

Scientific Names of Pests.

Heliothis or tomato grub	*Heliothis armigera* (Hubn.)
Tomato mite	*Vasates lycopersici* (Massee)
Root-Knot nematode	Mainly *Meloidogyne javanica* (Treub) Chitwood
Cutworms	Mainly *Euxoa radians* (Guen.)
False wireworms	Mainly *Dasus macleayi* (Blkb.)
Tomato jassid	*Austroasca viridigrisea* (Paoli)
Green loopers	*Plusia chalcites* (Espr.) and *P. argentifera* Guen.
Cluster caterpillar	*Prodenia litura* (F.)
Green vegetable bug	*Nezara viridula* (L.)
Shield bugs	Mainly *Plautia affinis* Dall.
Rutherglen bugs	*Nysius vinitor* Bergr. and *N. clevelandensis* Evans
Tomato mirid	*Cyrtopeltis tenuis* (Reut.)
Thrips	Mainly *Frankliniella* sp.
Tomato aphid	*Macrosiphon solanifolii* Ashm.
Fruit flies	*Strumeta tryoni* (Frogg.) *Strumeta humeralis* (Perkins) *Austrodacus cucumis* (French)
Grasshoppers	Mainly *Peakesia straminea* Sjost.
Potato tuber moth	*Gnorimoschema operculella* (Zell.)
Red spider mite	*Tetranychus urticae* Koch.

TOBACCO GROWERS!

Sending cash with orders for tobacco seed will ensure immediate despatch.

Ordering seed C.O.D. may involve considerable delay.

Indicate a second preference in case the desired variety is unavailable.

Seed is sold to Queensland tobacco growers at the rate of 6/- per ounce.

Reasonable stocks of the following varieties are on hand:—

Hicks	Virginia Brightleaf
Virginia Gold	Mammoth Gold
Gold Dollar	402

Grapes in Southern Coastal Queensland

By R. L. PREST, Senior Adviser in Horticulture.

In coastal south-eastern Queensland, grapes are grown solely for dessert use, the more important producing areas being around Brisbane and Rockhampton.

Particularly well known are the Pinkenba and Nudgee areas of Brisbane, where table grapes have been produced for the past 60 years. Some expansion of the industry has recently taken place and small vineyards have been established in the Wellington Point and Darra districts, where the crop was formerly of little importance.

In these areas, grapes are usually grown in conjunction with vegetables and other small crops, the labour commitment in which does not clash with that in the summer grape harvest. The vineyards are usually not large; two to five acres is considered a satisfactory area on farms with a diversified cropping programme.

The average commercial life of the vineyard is approximately 15 years.

Varieties.

A dessert variety of grape must be suitable for the district in which it is grown and produce fruit with those qualities which are desired by the consumer—attractive colour, form, size, flavour and texture. Earliness of maturity is an important consideration in coastal Queensland, not only from the point of view of placing the crop on a bare market, but also to avoid losses during the wet season when the relative humidity is high. Under wet conditions, it is very difficult to control fungous diseases such as anthracnose, downy mildew and powdery mildew.

In districts infested with and quarantined for Phylloxera, varietal and/or stock resistance to this pest is essential. American varieties of the Labrusca type, such as Iona and Wilder, were included in earlier plantings. While these varieties are tolerant to humid conditions and show some resistance to both the more common diseases and Phylloxera, their fruit is inferior to that of European varieties.

At the present time, therefore, plantings comprise mainly European table grapes such as Muscat Hamburg and Black Hamburg. These are usually established on Phylloxera-resistant stocks such as ARG1 and 1202 in areas where the aphid has been troublesome and in areas where, owing to the infertility of the soil, a stock which confers vigour on the scion variety is considered necessary. Elsewhere, they are grown on their own roots.

Two resistant stocks—1202 and ARG1—have proved suitable for the Muscat Hamburg but the former is generally preferred by growers. Vigour of the vine, cropping habits, berry and bunch size are usually good but there is a tendency for the fruit to colour later than is altogether desirable. This defect, however, can be partially offset by judicious summer pruning.

The Muscat Hamburg is probably the finest and most popular of the table grapes grown in Queensland. The bunches are large-shouldered, tapered and fairly compact. The large, black, oval berries have an

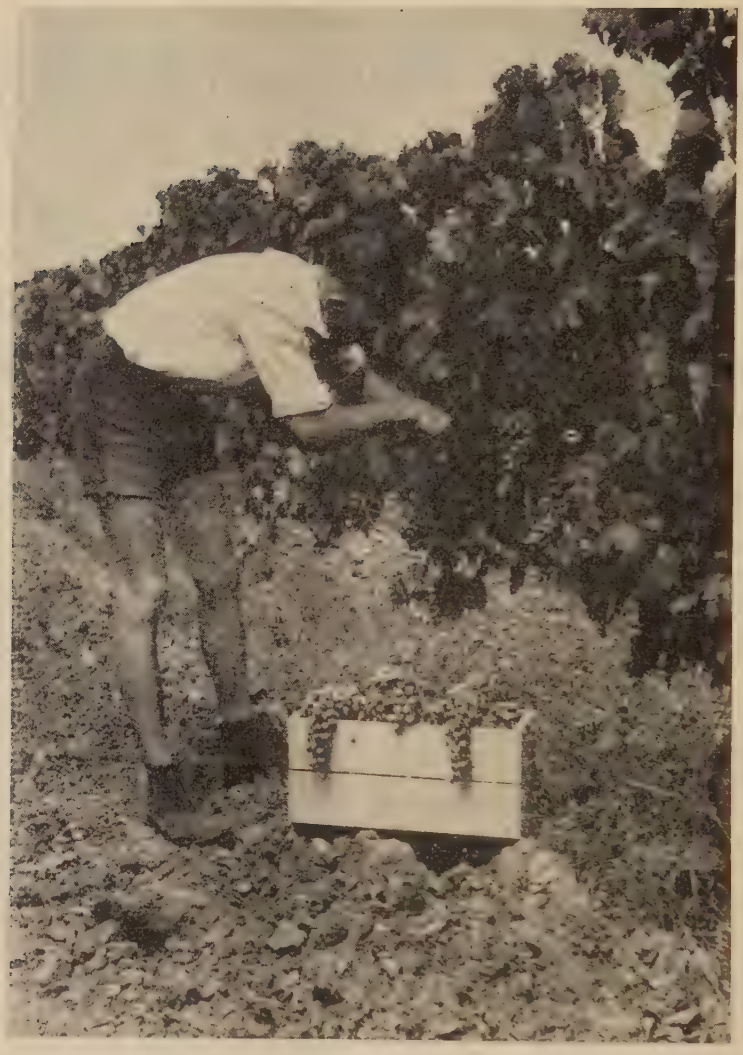

Plate 1.

Harvesting the Muscat Hamburg Grape. The crop reaches maturity in the December-January period and meets a strong market demand.

attractive blue-grey bloom and are thin-skinned; the sweet pulp has a pronounced Muscatel flavour.

The Black Hamburg is also a popular variety, mainly because of the extremely high yields obtained per acre. Berry quality is, however, inferior to that of the Muscat Hamburg and market values for the fruit are correspondingly less. Unlike Muscat Hamburg, late summer pruning cannot be practised in the Black Hamburg owing to the risk of scald in the exposed berries.

Crop Management.

In some varieties of table grape, fruit of the highest quality can be produced only when the vines are pruned to a limited number of spurs,

each with one or two buds. In old-established coastal grape-growing centres, notably the Pinkenba-Nudgee area, the bilateral cordon system of short pruning is adopted for both the Muscat Hamburg and Black Hamburg varieties. Under this system, the vine is trained to two arms with evenly spaced spurs carrying two buds. One of the canes from the spur bears the current year's crop and is completely removed in the following winter. The other is shortened to two buds.

In establishing the framework of the vine, two canes are trained in opposite directions along the bottom trellis wire and ultimately form arms about 2½ ft. long which provide the permanent framework of the vine. Fruit-bearing spurs are formed on the top of these arms by pruning selected canes back to two buds. The spurs are spaced approximately 6 in. apart and each arm carries five or six spurs.

When the vines are a few years old, the spurs tend to become twisted, knotty and elongated. To rectify this defect, a vigorous shoot appearing at or about the base of the spur is retained to form a replacement spur in the following year. The old, overgrown spur is then removed during the winter pruning.

Spur pruning is frequently followed by the development of several unwanted shoots. These are broken out while they are still brittle but not before they are sufficiently well developed to indicate which of them will carry fruit. Any water shoots on the old wood are removed unless they are needed to replace excessively long spurs or to fill a gap between adjacent spurs. Two or three shoots may arise from each bud but only the strongest should be left at any one node.

Pinching assists the setting of the fruit. Some vines habitually set poor crops and nipping off the tips of the canes when the blossoms begin to open improves setting. The check to shoot growth is negligible.

Plate 2.

Spraying the Grape Crop. Efficient control of diseases such as downy mildew and anthracnose is essential in coastal districts.

Plate 3.

Training the Vine. The bilateral cordon system is popular in some districts. Arms carry 2 years' growth.

When heavy shading tends to retard normal colouring of the berries, judicious thinning during early summer is an advantage, at least in Muscat Hamburg, which is less susceptible to scald than Black Hamburg.

In recent years, some growers in coastal districts have practised a method of long pruning which is a modification of the Bordelaise system of rod and spur pruning. Excellent results are claimed for this method in areas where Muscat Hamburg vines fail to produce satisfactory crops when spur pruned.

Cultivation and Nutrition.

During the drier spring and early summer months, cultivation to suppress weed growth and prevent competition with the vines for soil moisture is important. In early spring, the inter-row spaces are shallow ploughed, the soil being thrown away from the vines. Light cultivation follows as and when necessary to suppress weed growth.

On completion of the harvest and prior to the summer rains, the vineyard is again ploughed, the soil being this time thrown towards the vine. The resulting dead furrow in the centre of the avenue provides inter-row drainage during the wet season. A weed cover is maintained during the summer months to prevent soil erosion.

Many of the soil types selected for grapes contain sufficient plant food to meet the requirements of the vines during the first year or two after planting. From then on, it is usually necessary to fertilize.

Grape vines require relatively small amounts of nitrogen and phosphorus but use appreciable amounts of pottassium. On most soils, therefore, fertilizer mixtures which are rich in potassium are popular. An early application in late winter or spring of a 5-13-8 or similar mixture at a rate of 3-4 cwt. per acre should prove satisfactory.

If boron deficiency symptoms occur on the vines, they may be overcome by the application of an 0.5 pér cent. borax spray applied to the foliage some three weeks before blossoming. Trees suffering from this disorder are characterised by lack of vigour and frequently produce an abnormally high proportion of small, seedless berries in the bunch, a phenomenon known as "hen and chickens."

Deciduous Fruit Varieties in the Granite Belt

By M. A. HANNIGAN, Senior Adviser in Horticulture.

Fruit trees live for many years, and once an orchard has been planted it is a tragedy if it fails to produce a reasonable farm income. Before establishing a new orchard, therefore, consideration should be given to three factors which influence the planting programme. These are climate, soil and varieties.

CLIMATE.

The climate of the Granite Belt is by no means ideal for deciduous fruits, mainly because temperature and rainfall vary a great deal from season to season and particularly in the critical period when the trees and vines are setting fruit.

Although there is not a great variation in climate throughout the district as a whole, areas south of Stanthorpe receive less rain from easterly drizzles in January and February than areas to the north. As a result, grapes and stone fruits do better than apples in the southern part of the Granite Belt. Apples, on the other hand, are the most popular crop in the northern end of the district.

Most of the land between Stanthorpe and Wallangarra is hilly. Stone fruits and grapes planted in this area on slopes with a north to north-easterly aspect suffer little damage from late spring frosts and mature their crops relatively early. This is, of course,

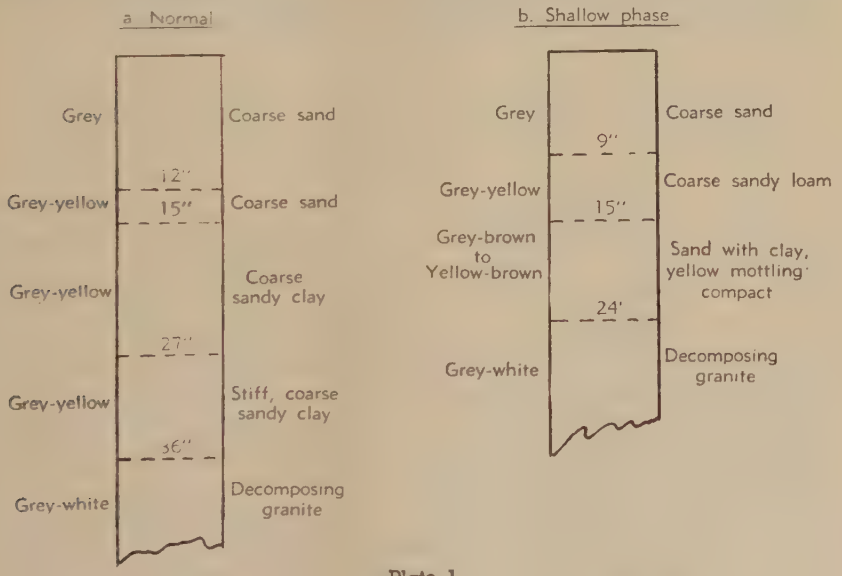

Plate 1.

Soil Profiles in the Orchard. That on the left is satisfactory; that on the right has impermeable clay at shallow depth and would probably be risky for Delicious apples after heavy rain.

Plate 2.

Top-working the Apple Tree. Once popular varieties for which there is now little demand must be top-worked to types such as Granny Smith and Delicious.

important in commercial practice, for early fruit commands high prices on the market.

SOIL.

Because Stanthorpe soils are derived from granite and are usually low in nitrogen and organic matter, new growers are apt to think that deciduous fruit trees and grape vines will grow in any kind of soil. This is far from true; they require a moderately fertile soil which is deep and well-drained. Some shallow and badly drained soils in the district are totally unsuitable for fruit growing.

In the northern part of the district, the better orchards are situated on fine-grained sandy loams with a depth of 9–12 in. of surface soil overlying a permeable clay subsoil. On such soils, most varieties of apples do well. On less well drained soils, the behaviour of any variety depends on its tolerance to faulty drainage.

Some varieties of apple grow better in shallow soils than others; Delicious, for example, reacts more quickly to poor drainage than does Granny Smith, and Jonathan survives longer in a poor soil than Delicious. Pear

trees grow satisfactorily in moderately heavy alluvial soils; they are less exacting in their requirements than many other deciduous fruits.

The coarse-grained and moderately deep granitic soils on hillsides and valleys of the southern part of the district are well suited to stone fruits and grapes.

VARIETIES.

In selecting varieties of fruit for a new orchard, the main points to consider are market requirements and efficient use of labour.

Apples.

In the pioneering days of fruit growing in the Stanthorpe district, it was a common practice to plant a few trees of every available variety. In recent years, however, there has been a gradual change-over to varieties of recognised commercial value.

The change began when export of apples commenced in the early 1930's. Before a variety can be considered suitable for export and other distant markets, the fruit must carry well and have an agreeable flavour and attractive appearance. At one time, Granny Smith, Delicious, Jonathan and Dunn apples were exported, but the current demand is now limited to Granny Smith and Delicious.

The Gravenstein apple still holds pride of place as the best early cooking and dessert variety even though the tree is susceptible to "gnarl" and usually not long-lived. Jonathan and McIntosh Red apples are mid-season red types which meet a ready sale on Queensland markets.

The demand for cooking varieties such as Lord Nelson and Twenty Ounce decreased rapidly as Granny Smith—a dual purpose cooking and eating apple—found favour with the consumer, for it can be cool stored until November without any difficulty.

The status of the main apple varieties in 1935 and to-day is indicated in the following table:—

Variety.	Area Under Crop (1935). %	Plantings (1947–52.) %
Granny Smith ..	36	40
Delicious ..	11	35
Jonathan ..	22	12
Gravenstein ..	9	7
Others	22	6

Pears.

The main commercial varieties of pear are Packhams Triumph, William Bon Chretien and Winter Cole. Packhams Triumph and William Bon Chretien are stored for a short period and sold ex cold stores according to market requirements.

Stone Fruits.

Stone fruits are sold on the fresh fruit market and portion of the crop may be cold stored for short periods to spread supplies over a few weeks. In selecting varieties of stone fruit for an orchard, consideration must be given to harvesting operations, since all varieties mature their fruit over a short period once harvesting begins.

The principal plums grown are the Japanese varieties Wilson, Santa Rosa, Burbank and Doris, and the European varieties Angelina and President.

Peach varieties may be grouped into early, mid-season and late-season varieties. Fruit quality in the early varieties is not particularly good and the acreage planted in recent years has shown a decline. The main early varieties in their order of importance are Wiggins, Mayflower and Highs Early Canada. Mid-season varieties should be limited to Blackburn Elberta, Dripstone Elberta, J. H. Hale, Beale and Smith's Seedling. Late varieties of peach are mainly of the clingstone type and are grown principally for canning; there

Plate 3.

Peaches Ready to Pick. The peach is one of the principal stone fruits, particularly in the southern end of the Granite Belt.

Plate 4.

Vineyard in Winter. The tangle of old canes will be cut away when pruning begins in August.

has so far been little demand for canning peaches in Queensland and varieties of this kind are of no great commercial importance. Golden Queen is the main representative of the group.

Apricot trees do not thrive in the Stanthorpe district but most orchardists have a small area under crop for the early market. Trevatt, Moorpark and Newcastle are the best of those available.

Grapes.

The grape varieties most suited to the Stanthorpe district are Muscat Hamburg, Waltham Cross and Purple Cornichon, which are early, mid-season and late-season types respectively. These three varieties provide the bulk of the crop but several others are represented in the district.

TYPES OF ORCHARD.

The fruit harvesting season in the Granite Belt extends from the end of November until the middle of April. Growers try to harvest fruit continuously during that period so that the available labour will be fully employed. In order to meet this essential requirement of orchard management, it is usual to plant two or more kinds of fruit in the one orchard. Three possibilities are:—(*a*) apples, pears and stone fruits; (*b*) stone fruits and grapes; and (*c*) stone fruits and apples. The choice for any particular property depends principally on location and soil type.

Apples, Pears and Stone Fruits.

In this class of orchard, apples are the main crop. New growers should, in the first instance, plant a limited area which can be managed comfortably and extend the orchard later on when circumstances permit.

The varieties in such an orchard (listed in their order of maturity) could be:—Wilson and Santa Rosa plum, 1 acre; Gravenstein apple, 1 acre; McIntosh Red apple, 1 acre; Jonathan apple, 1 acre; William Bon Chretien and Packhams Triumph pears, 1 acre; Delicious apple, 5 acres; Granny Smith apple, 5 acres; total, 15 acres.

Stone Fruits and Grapes.

An orchard of this kind could include:—Newcastle apricot, ¼ acre; Wilson plum, ½ acre; Trevatt apricot, ¼ acre; Santa Rosa plum, ½ acre; Wiggins (or Beale) peach, ½ acre; Burbank and Doris plums, 1 acre; Halehaven peach, ½ acre; Blackburn Elberta peach, 1 acre; Dripstone Elberta peach, 1½ acres; President plum (with Angelina pollinators), ½ acre; Golden Queen peach, ½ acre; Muscat Hamburg grape, 1 acre; Waltham Cross grape, 1 acre; Purple Cornichon grape, 1 acre; total, 10 acres.

Stone Fruits and Apples.

An orchard of this type could include:—stone fruits (as in the previous orchard), 7 acres; Delicious apple, 1½ acres; Granny Smith apple, 1½ acres; total, 10 acres.

Single Fruit.

A number of orchards in the Stanthorpe district contain only apple trees or stone fruit trees or grape vines. When planning an orchard or vineyard with only one type of fruit, varieties should be selected which mature their crops in succession. If there are too many trees or vines of the one variety, difficulties in harvesting are bound to occur.

NEW MACHINES ACCELERATE PROGRESS ON IRRIGATED PASTURES.

Four modern land-levelling machines recently brought to Queensland are speeding up the preparation of land for border irrigation of pastures and lucerne. At the same time, they are reducing the cost.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said that two of the machines are big automatic types suitable for grading large areas. They are similar to the machines used on big irrigation projects in the United States and in southern States of Australia. The other two are small orchard-type land levellers, suitable for areas up to 10 acres.

The levellers have been supplied from Commonwealth Extension Services Grant funds. They are being used to demonstrate to Queensland farmers the efficiency of modern land-levelling equipment. Only one man, the tractor driver, is needed to operate both types of machines, compared with two on the types previously in use.

One of the automatic land levellers is stationed at Biloela to serve farmers in the expanding Callide and Dawson Valley irrigation areas. This machine has already prepared 150 acres of land for border irrigation. Farmers at the Moura irrigation settlement are calling on it to prepare several hundred acres for irrigated lucerne and pastures.

The other machine is at Toowoomba, and is intended for use on the Darling Downs and in the Cecil Plains area. Although it was sent to Toowoomba only last month, 50 acres have already been graded.

The orchard type land levellers are at present stationed at Esk and Kingaroy to serve farmers in those areas. The machine at Esk has prepared small areas for irrigation on six Brisbane Valley farms, and heavy demands are being made on the Kingaroy machine.

Mr. Collins said the introduction of these machines is a further step towards reducing the cost of establishing irrigation projects on Queensland farms. The demonstrations being given will clearly show farmers that, where the soil type and slope are suitable, border irrigation for pastures and lucerne is the most economical method of applying water.

WILD DUCK BANDING PROGRAMME.

A bird banding scheme to assist in studying the habits and migrations of wild ducks in Queensland has been commenced by officers of the Department of Agriculture and Stock.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said this work is part of a long-range programme for the assessment of Queensland's wild life. The objective is to conserve beneficial species and to restrict the damage to agriculture caused by others.

Bird banding means the marking of birds with numbered metal bands attached to the bare part of a leg. Properly done, banding is neither cruel nor harmful. As the numbered bands are made of aluminium, their weight is not a burden. In fact, any interference with the birds' normal activities would defeat the whole object of the scheme.

Recently, some hundreds of maned geese (wood ducks) from swamp land near Beenleigh were banded, and black ducks were banded at a dam near 17-Mile Rocks. Each band bears a serial number and the inscription: "Notify Ag. and S. Dept., Qld."

As an open season for duck in Queensland has now been declared, shooters are likely to bring down banded birds, and shooters in other States are also likely to take them.

Mr. Collins said the success of this study depends on the return of bands to the Department. He therefore asks shooters to forward bands from dead wild ducks and information on the time and place of the find to the Fauna Officer, Department of Agriculture and Stock, Brisbane. If a banded duck is captured alive and then released, the band should not be removed, but relevant information on the captive would be appreciated.

Five Queensland bands have already been returned from the Clarence River area of New South Wales.

The Department of Agriculture and Stock, which is responsible for fauna conservation in the State, asks all bird enthusiasts and duck shooters for their help in mapping the migration of Queensland wild ducks.

American Foul Brood

C. ROFF, Adviser in Apiculture.

American foul brood is the most serious of the diseases affecting bees, and is responsible for losses in the beekeeping industry in many parts of the world. Economical management of bees is not possible in an infected apiary; however, the chances of serious losses are considerably reduced if beekeepers are familiar with the symptoms and with the correct procedure for dealing with an outbreak of the disease.

The organism causing American foul brood is a bacterium (*Bacillus larvae* White) which, under suitable conditions, multiplies very rapidly. It is able to form resting bodies or spores which may remain viable and infective for long periods and are resistant to moderate heat and disinfection.

The most common means of spread of these spores are the utilisation of infected honey by nurse bees and the transfer of infected brood combs. The disease may also be transmitted by contaminated beekeeping equipment and the drifting of bees from diseased to healthy hives.

Position in Queensland.

Outbreaks of American foul brood during recent years at Pinkenba, Caloundra, Karara, Blair Athol, South Brisbane and Limevale have given rise to anxiety in the beekeeping industry. The moving of apiaries from district to district has been practised extensively by beekeepers and has resulted in large crops of honey being harvested. Concurrent with the increase in migratory beekeeping, however, there has been a spread of American foul brood.

A certain amount of migration will always be necessary, but it is desirable for beekeepers to adopt a thoughtful attitude in regard to the movement of apiaries in order to avoid consideration being given to restrictive disease control measures. Any such measures would undoubtedly limit the free moving of apiaries.

Routine Inspections.

It is sound beekeeping practice *to inspect regularly* the brood in every colony to ascertain whether American foul brood is present. *Furthermore, these inspections must be carried out thoroughly, and the work should be undertaken as a separate operation, and not in conjunction with other tasks.*

Features of the Disease.

(1) Larvae of all three castes are susceptible, and infection takes place only during the larval feeding period. Death occurs invariably after the capping of cells, when the insects are still in the late larval or early pupal stages.

(2) Larvae are susceptible to infection in all seasons, and an outbreak of the disease may appear irrespective of the quantity of food available.

(3) All races of honeybees are susceptible to American foul brood.

(4) Infected honey is not injurious to humans.

Symptoms.

(1) The colony is noticeably weak.

(2) The brood comb has an irregular appearance. In healthy brood the cappings are slightly convex, but where death has occurred they become concave or sunken and may be perforated. In addition, capped cells are somewhat scattered, giving what is often termed a pepper-box appearance (Plates 1 and 2).

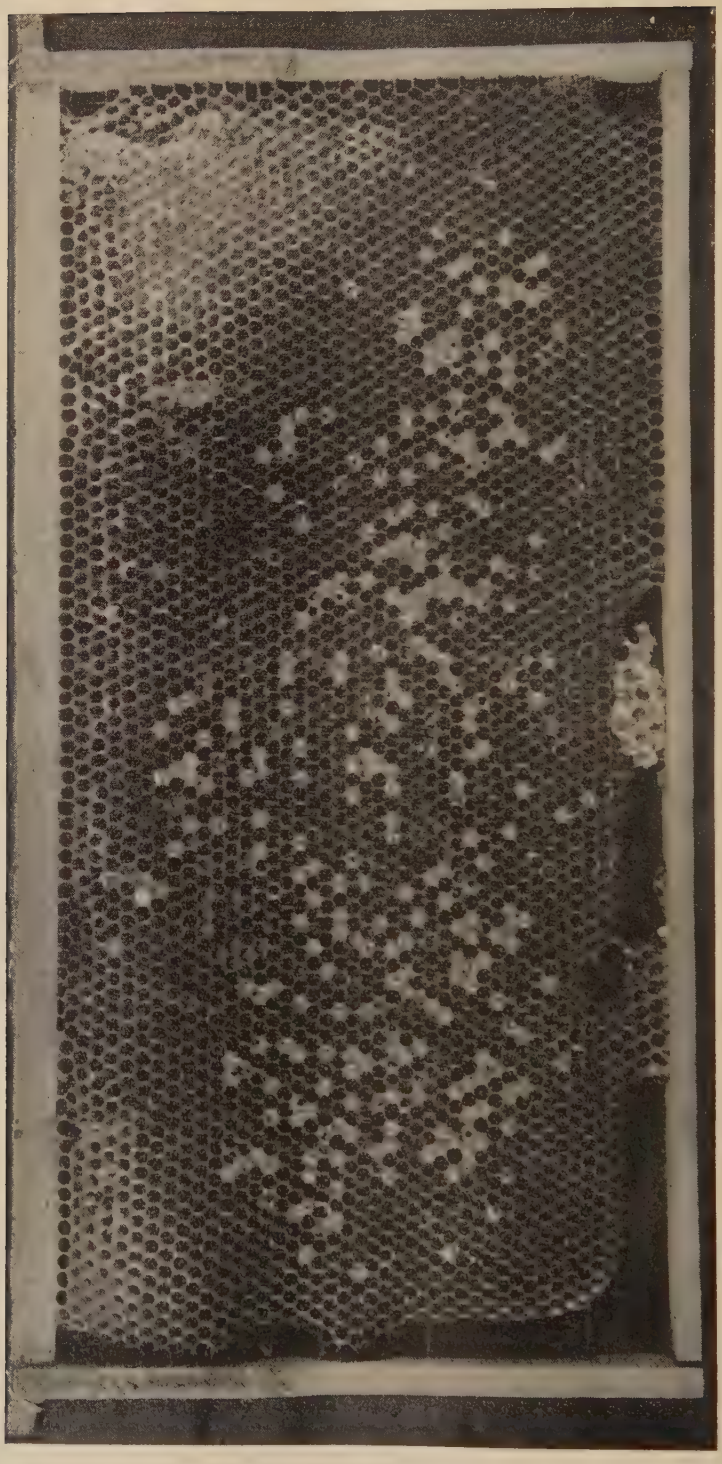

Plate 1.

Brood Comb Infected with American Foul Brood, Showing the Irregular Distribution of Capped Cells.

(3) Diseased larvae or prepupae are at first slightly yellowish in colour, but as decomposition advances they gradually change to brown. The dead larvae are usually extended lengthwise in the cells.

(4) The decaying contents of a cell may, before drying, be drawn out with a wooden match or a splinter of wood into fine, glue-like, ropy threads. In drying, a tough dark-brown or coffee-coloured scale is formed which the bees

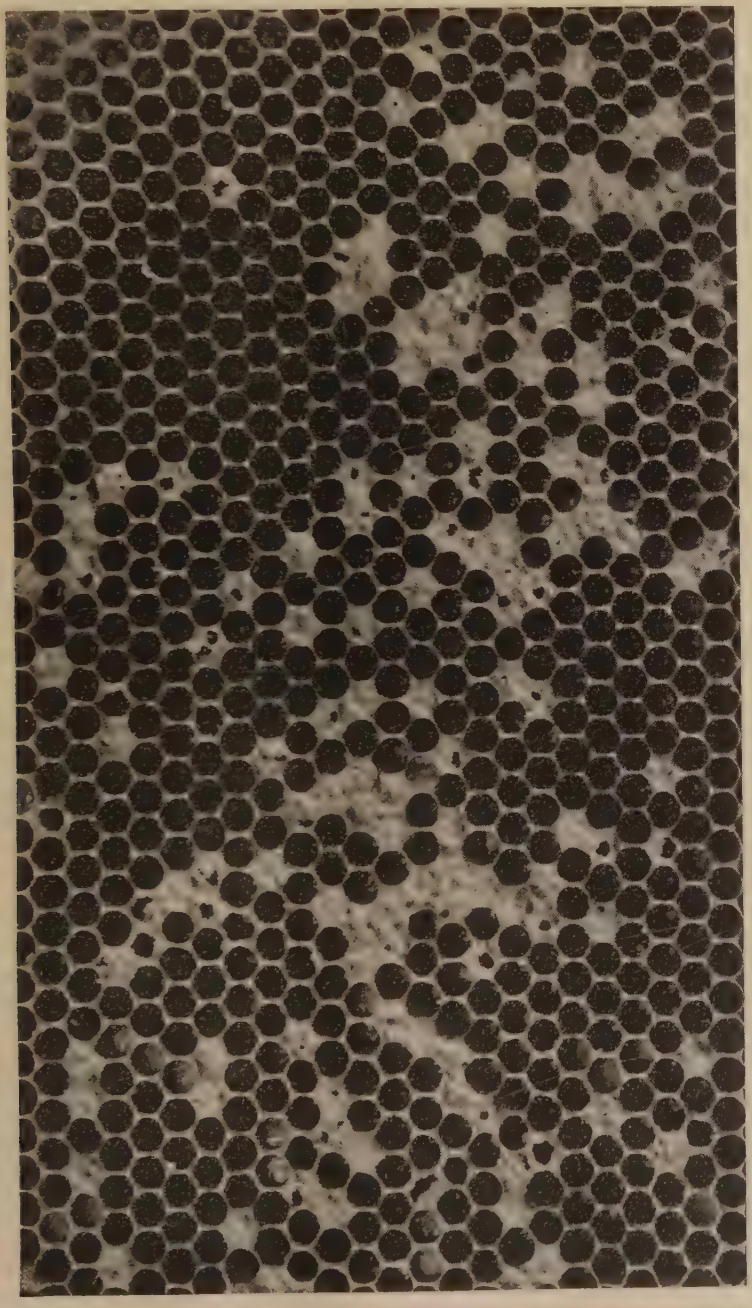

Plate 2.
Portion of Infected Brood Comb, Showing Sunken and Perforated Cappings.

cannot remove. This may be seen extended along the lower side walls when the comb is held so that the sunlight falls on the side and lower walls of the cell.

(5) Where death has occurred after pupation a partly developed "tongue" may protrude as a fine thread upwards and backwards from the scale, sometimes adhering to the upper wall of the cell.

(6) The odour in an infected hive may become heavy and foetid, and has been likened to that of stale glue.

Preventive Measures.

The following measures for preventing the appearance and spread of American foul brood are recognised as sound:—

(1) The interchange of brood combs between hives and apiaries should be reduced to a minimum.

(2) Any manipulations or activities which induce robbing should be avoided.

(3) Second-hand bee equipment should be bought only after inspection has established freedom from disease.

(4) Honey from an unknown source should never be fed to bees.

(5) If second-hand honey tins are used great care should be exercised to ensure that the bees do not have access to them.

Treating Infected Colonies.

All contents of diseased hives should be burnt and the hives themselves decontaminated according to the following method, which is the safest and most economical:—

(*a*) The destruction of diseased colonies should take place in the evening when all bees are in the hives.

(*b*) Dig a pit of a size suitable for the number of colonies to be destroyed.

(*c*) Kill all bees in the diseased hives with calcium cyanide; about two teaspoons of the poisonous powder should be put through the entrance of each hive before closing it. *Extreme care should be taken to avoid inhaling the poisonous gas given off by the cyanide.* If calcium cyanide is not readily available the hive entrance should be closed, a pint of petrol sprinkled over the top frames, and the top cover replaced.

(*d*) Build a fire in the pit, and as soon as it is burning well, add the dead bees and combs. The only parts of the hives not to be burnt are the bottom-boards, the hive-bodies of the brood nests, the bodies of the extracting supers, and the top covers. Care should be taken in burning any petrol-soaked material.

(*e*) Remove all metal rabbets and then scrape the inside surfaces of the unburnt parts of the hives and burn the debris.

(*f*) After all diseased material has been burnt, spade the ground down, refill the pit, and pack well.

(*g*) Sterilize the undestroyed, contaminated hives and hive parts by either boiling for half an hour in 1 per cent. caustic soda solution or scorching all the inner surfaces and edges to a dark-brown colour with a blow torch.

Legislative Requirement.

Under *"The Apiaries Act of* 1947," it is provided that any beekeeper in whose apiary any disease appears shall immediately notify, in writing, the Under Secretary, Department of Agriculture and Stock, Brisbane.

Irrespective of the legal requirements, any beekeeper who notices unusual brood symptoms in his apiary should, for his own sake, communicate promptly with the Department in order that assistance may be rendered in treating the trouble.

Is Feeding Weaner Sheep Good Business?

By HAROLD POPE and G. R. MOULE, Sheep and Wool Branch.

Young weaners are your most important sheep. They are the makings of your future flock, and the mothers-to-be of your next lamb drop. But there are years when all is not well with your weaners. Unthriftiness in weaner sheep is a common problem. It occurs in Queensland as well as in the other Australian States and New Zealand.

The causes of some kind of unthriftiness are well known, others remain obscure. It is well known that worm infestation can hold the weaners back; it may even cause some losses. Cobalt deficiency used to cause severe losses in some years in South Australia. In other years weaners in the same district did not grow very well. They showed no other symptoms of cobalt deficiency. However, when given a supplement of cobalt these sheep made rapid growth. Many trials have been conducted in Queensland to see if cobalt supplements ensure faster growth rates. Promising results have been obtained in only two instances.

It is well known that weaners will not do well on long, rank, dry feed. Paradoxically, they may not do very well when the feed is lush and green after heavy summer rain. In the former case the feed is too fibrous; in the latter, it lacks fibre and contains too much water. Perhaps the limited gut capacity of such young sheep prevents them from handling enough feed to obtain the nutrients they require.

It has already been proved that vitamin A supplements help weaners over a dry period. Weaners given supplements of vitamin A probably will not grow any more quickly than those not given vitamin A. However, the quite heavy losses that can occur amongst weaners on dry feed can be averted by giving them vitamin A. It has also been shown that feeding weaners supplements rich in protein is of great benefit when pastures are dry.

The question "Is feeding weaner sheep good business?" remains unanswered in the minds of woolgrowers. A trial recently conducted by Mr. E. Telford of "Telco", Bymount, contributed useful information on this point.

History of Season and Sheep.

Bymount has an average rainfall of 23 in. Grass-making rain usually falls in December, January, February and March, and in May, June and July. The winters are cold, and as a result few plants grow well at that time. The feed resulting from the summer rains dries quickly with the first frosts.

Almost 35 in. of rain fell between January and May of 1956. This had been preceded by above-average falls of 35 in. in 1954 and 41 in. in 1955. The distribution of the rain in early 1956 and during the sheep feeding is shown in Plate 1.

By May of 1956 the weaner flock on "Telco" was beginning to show the effects of the unusual season. This included 230 August/September (1955) drop, and 370 November/December (1955) drop sheep. By May they were backward in condition and between 5 per cent. and 7 per cent. were very weak. Mr. Telford had taken care to prevent worm

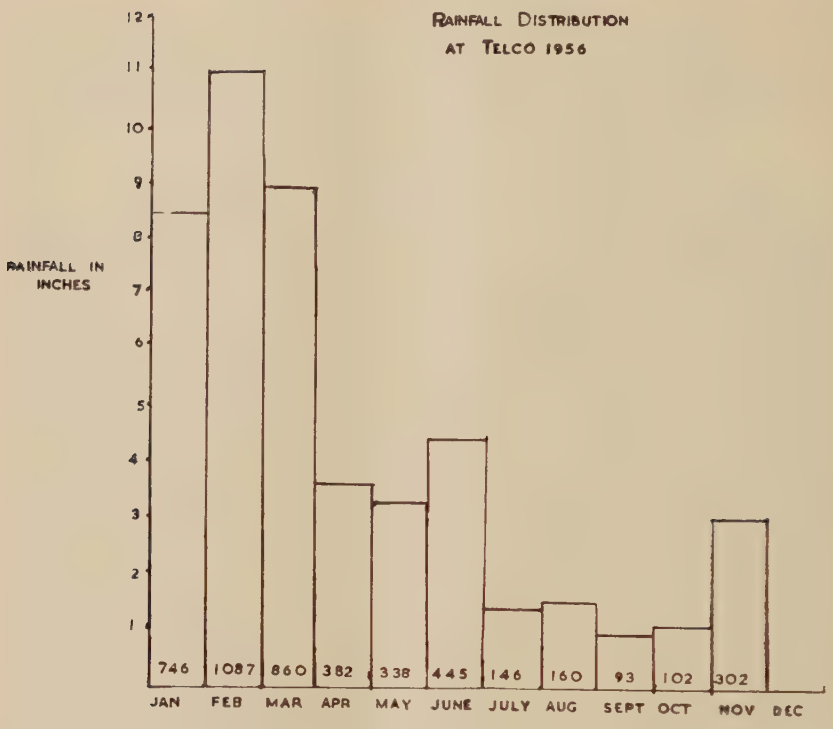

Plate 1.

Graph Showing Rainfall Distribution at "Telco" in 1956.

infestation of his sheep, and he decided to feed them a supplement.

Organising the Feeding.

Feeding commenced on May 22, 1956. Two paddocks were available, one of 640 acres and the other of 230 acres. The 200 weak sheep were drafted off and were run in the smaller paddock; the remaining 400 ran in the larger paddock. This gave stocking rates of 1 sheep to 1·6 acres for the lead, and 1 sheep to 1·15 acres for the tail.

The state of the pasture in these paddocks was:—

640-acre paddock.—Dry at the top but five inches of green grass at the butt.

230-acre paddock.—Grazed fairly close; a few acres of oat crop on the flat grazed right out.

A ration of crushed sorghum, meatmeal and sterilized bonemeal was used. This was mixed in the ratio of 4 parts of sorghum to 1 part of meatmeal.

To start with, 1 lb. of sterilized bonemeal was added to each 99 lb. of this mixture. Later, this was increased to 5 lb. to each 95 lb. of mixture.

The stronger sheep in the larger paddock were fed at the rate of 2 oz. per head per day; the weaker sheep in the smaller paddock at 3 oz. per head per day. Log troughing was used for the feeding, 210 running feet being available for the 600 sheep. This works out at approximately 8 in. per sheep. At the start, diluted molasses was spread over the feed in the troughs by means of a watering can. The weaners took to trough feeding readily.

At first, the weak sheep were fed daily for five weeks. By the end of a fortnight they had not gained very much weight, although they were stronger. After the first five weeks they were fed three times weekly until just before shearing.

Initially, the stronger sheep were fed every third day. This was continued for a month, when the feeding arrangements were extended to intervals of three and four days—that is, the sheep were fed on the third and seventh day of each week.

The sheep were shorn between Sept. 10 and Sept. 14. The average greasy fleece weight of the lead sheep was 5·62 lb. per head, and of the weaker sheep 4·77 lb. per head.

After shearing, the two flocks were boxed and moved to a new paddock with fresher feed, where they remained until the trial ended on Nov. 9. From shearing until the end of the trial, the sheep were fed every five days.

Weight Gains.

Rain during the early part of the trial interfered with its organisation. However, the sheep were ear-tagged and weighed on July 27. The two groups—lead and tail—were run through a race and every twelfth animal was drafted off. These were used as a pilot lot to indicate how each group was faring. The sheep were weighed at intervals throughout the remainder of the trial. The average liveweights of these pilot groups are shown in Plate 2.

The lead group gained 3·8 lb. between July 27 and shearing at Sept. 10-14. The tail gained 7·3 lb. in liveweight. After allowing for the weight of the fleeces removed at shearing, the sheep gained little weight between Sept. 9 and Sept. 17. However, they improved rapidly during the ensuing few weeks.

As 137 points of rain fell on Nov. 10, Mr. Telford decided to cease feeding.

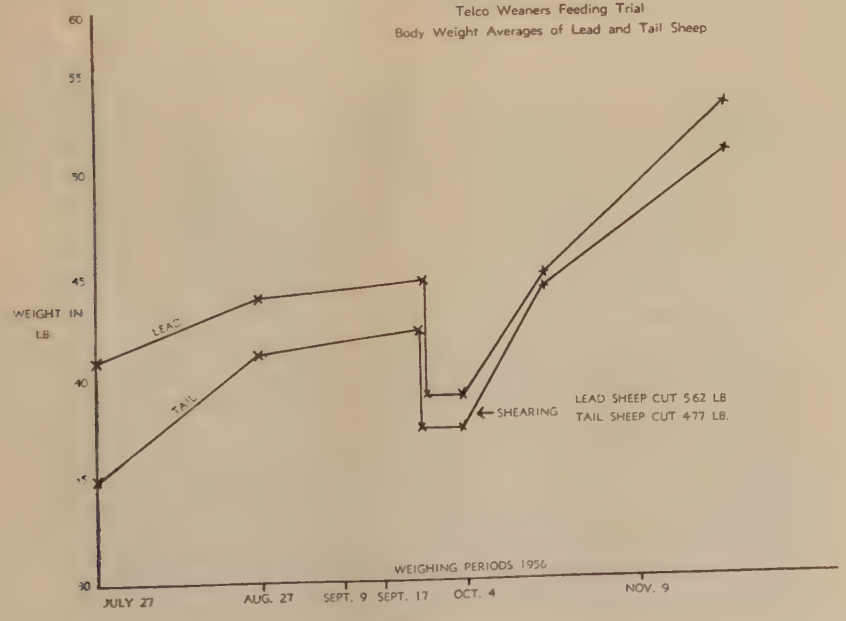

Plate 2.

Graph Showing the Average Body Weight of Lead and Tail Sheep at Various Times During the Feeding Period.

Plate 3.

Weaners at Their Final Feed in October 1956. Note the adequate space allowed at troughs and compare this with the crowding on another station shown in Plate 5.

Plate 4.

Another View of the Weaners at the Feeding Troughs at their Final Feed.

Plate 5.

The Importance of Allowing Sufficient Space for Each Sheep at Feeding is Evident from a Comparison of this Illustration with Plates 3 and 4. This photograph was taken during the 1948 drought on another station.

The length of the trial from the first weighing until the last was 15 weeks 3 days. The average gain per head over this period was 13·375 lb. The average weekly gain per head was 0·867 lb.

Losses Small.

Fifteen weaners died during the trial. Over 430 points of rain between June 22 and June 25 contributed to this loss. This occurred before the weaners had gained strength from the feeding.

The weaners were in first-class condition by the end of the trial. Mr. Telford considered that without supplementary feeding the losses might well have been as high as 15 per cent., as against the 2·5 per cent. that actually occurred.

Cost of Feeding.

The following materials were used for feeding the weaners on "Telco":—

	£	s.	d.
80 bags of grain sorghum (each 180 lb.) at £1 per bag	80	0	0
16 bags of meatmeal (each 140 lb.)	83	13	6
3 bags of sterilized bonemeal (each 100 lb.)			
	£163	13	6

Therefore, the cost of the feeding was approximately 3d. per head per week, a total of 5s. 5d. per head, to which must be added labour charges.

To draw up a balance sheet the advantages of feeding have to be assessed. These can be stated

simply; you can put your own cash value on them.

(1) Few losses occurred. Without a supplement many weaners would have died.

(2) Growth rates during the 15 weeks the sheep were weighed were good. The whole flock averaged a final weight which appears to be satisfactory.

(3) Higher cuts per head could be anticipated from sheep fed a supplement during their growing period.

(4) Quite apart from the likely material benefits, the abstract gain of less worry and anxiety about losses and lack of thrift in young sheep could be a comfort to a sheepman.

SIPHONS OR SLUICES FOR BORDER IRRIGATION?

Interest in the use of plastic siphon tubes to deliver irrigation water from the head ditch to the border is increasing in Queensland. Although siphons do a satisfactory job, their only advantage over sluice gates is their lower initial cost. In fact, Mr. A. Nagle, Irrigationist, Department of Agriculture and Stock, points out that, in operation, siphon tubes require constant supervision. Only the farmer can decide whether, on his property, the lower installation cost balances the higher labour charges.

Efficient use of irrigation water depends on the control over the quantity delivered from the head ditch. A constant flow cannot be used. The quantity must be varied according to the moisture content of the soil and the resistance of the movement of water down the irrigated slope by the cover of pastures or lucerne.

The usual method of control is to apply the water from the head ditch through wooden or concrete sluices. Slide or gate regulators give positive control of the flow. These cost £1 each or £5 an acre to install, or about £100 for a 20-acre field. Interest in the use of siphon tubes has grown because of their lower cost. A 6-ft. siphon tube of 2 in. plastic pipe costs about £1 10s. As 12 to 15 tubes should carry a flow of 20,000 gallons an hour, the total cost of siphon tubes to irrigate a similar area would be in the region of £20.

Where siphon tubes are used, fairly constant patrolling is required. Delivery of water into the head ditch must be exactly the same as the delivery into the borders. Variation either way causes the head ditch to overflow or the level in the ditch to fall so much that the siphons cease to function. It is desirable to use several small siphons per border rather than a single large one. Small siphons are easier to start and the flow can be adjusted by altering the number in use.

Before adopting either method, you should examine the labour cost of supervising both types. Wooden sluices would last 10 years, and on a yearly basis the cost would be 10s. an acre. With these, a controlled or varied flow is obtained more readily than with siphon tubes. Since eight to 10 irrigations are required each year, it's likely that the saving in labour by using sluice gates would amount to more than 10s. an acre.

A Cattle Crush Slide Bail

By K. F. HOWARD, Adviser in Cattle Husbandry, Miles.

Can you have a bail in your cattle crush and still use the crush for dipping, loading cattle or weighing?

Many cattlemen have an answer to this question but it generally entails the inconvenient dismantling of the bail when the cattle have to proceed further along the crush to the dip. This method has the added drawback of having no bail to use during the dipping, loading or weighing operation.

This article concerns a bail which was designed and built by Mr. M. L. Kaefer, of Chinchilla.

The advantage of this bail is that you can retain the effective sword-lever principle. When the remainder of the crush is to be used, you can pull the whole slide bail out as you

Plate 1.

Cow's View of Opened Bail, Looking Towards Loading Ramp.

Plate 2.

Bail in Engaged Position, Viewed from Loading Ramp. Note the two iron plates which for the sake of clarity are omitted from the plan of the bail. These ¼ in. plates are used as reinforcement. The top plate measures 3 ft. 4 in. x 9 in. and is bolted to woodwork and welded to support straps. The bottom plate is 9 in. x 7 in. and is bolted to the baffle board and bottom cross-piece.

would a slide gate. In fact, when the bail is not required as such, it can be used as a slide gate.

The posts that hold the bail in position in the crush should be faced to permit as neat a fit as possible. The less play the bail has, the longer will be its life.

The timber used in this bail was carefully selected spotted gum. Reinforcements and support straps are of ¼ in. and ⅜ in. iron. Bolts are ⅜ in.

The bail should combine a maximum of strength with no more weight than necessary. Details of construction are given in the illustrations.

Rollers.

Discarded back-axle roller bearings from a car can generally be obtained from a garage. To make the roller, press a piece of solid iron into the centre of the bearing. This iron is then burred at each end. A ½ in. hole is bored through the centre of the iron so as to take a ½ in. bolt.

Bail Lock.

To prevent a caught beast from opening the bail, a flat piece of metal hangs on the 4¾ in. by 4¾ in. upright. This lock swings to the perpendicular position when the bail is in the shut position and so locks down the lever.

Lever Handle.

The end portion of the lever is a length of 2 in. pipe which can be slid off when the bail is not in use.

Plate 3.

View of Bail from Outside of Crush. Bail is in position for catching beast. Note 3 ft. 10 in. gates at front of bail. These facilitate working at beast's head.

Plate 4.

Bail Has Been Pulled Out of Crush in the Same Manner as a Slide Gate.
This allows for the use of the loading ramp.

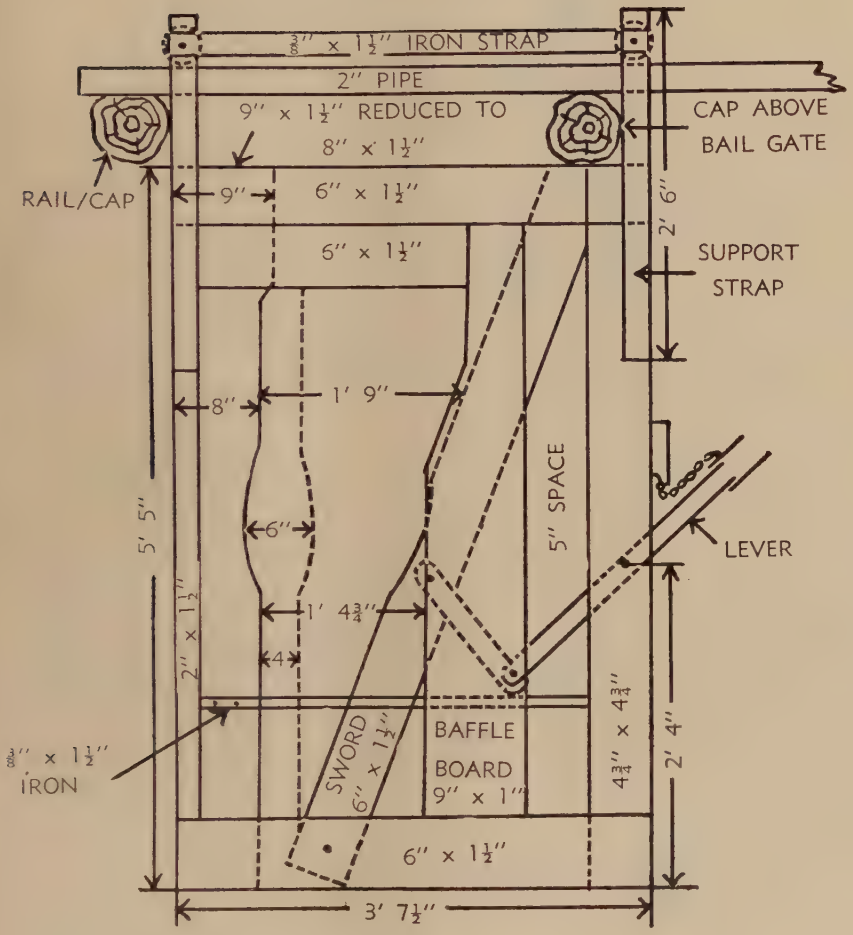

Plate 5.

Front View of Slide Bail.

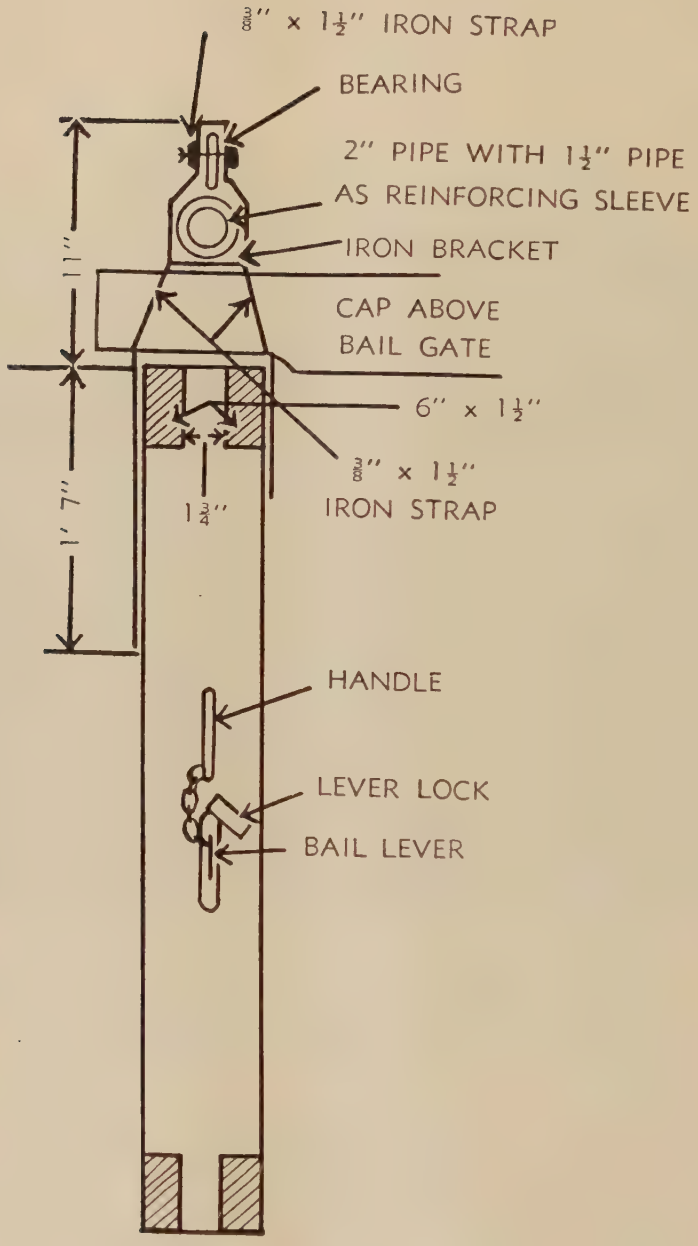

Plate 6.

Side View of Bail.

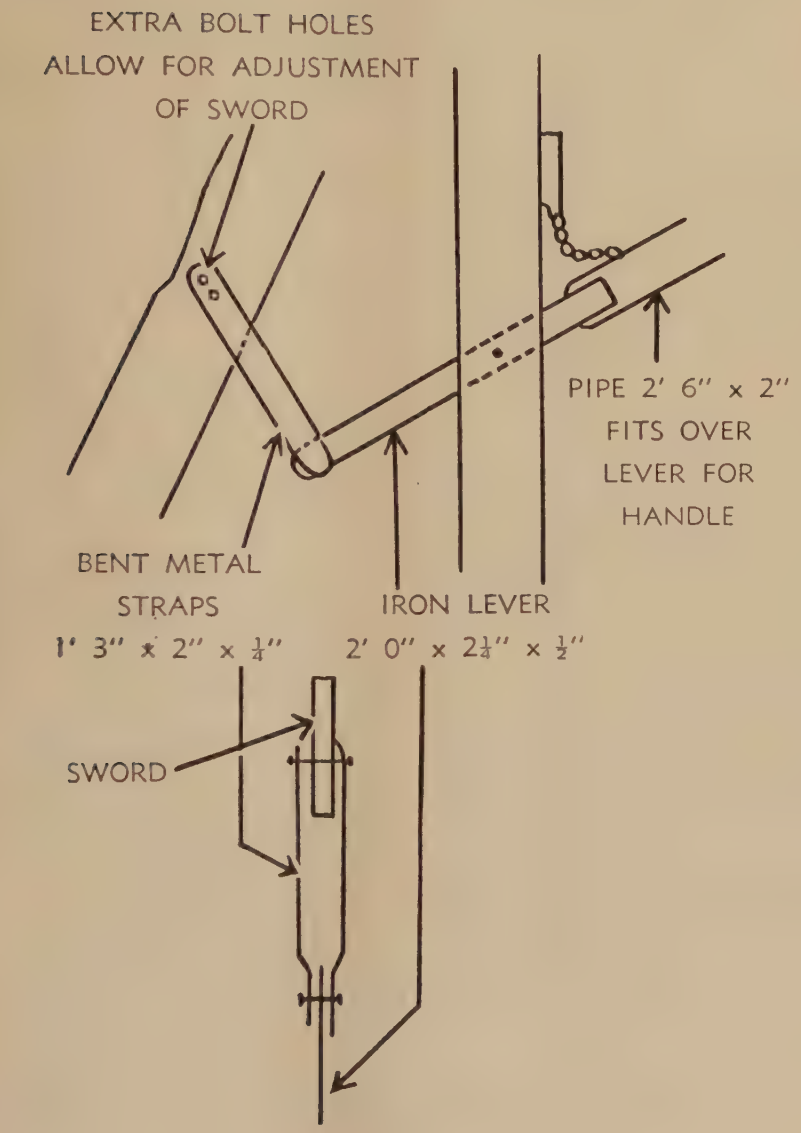

Plate 7.
Details of Lever.

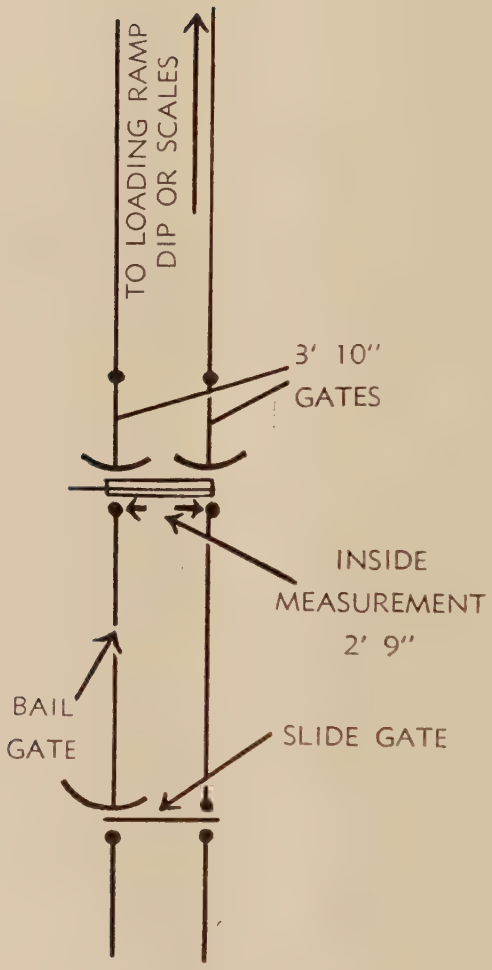

Plate 8.

Plan of Crush and Bail.

Base Your Herd Management on Production Records

By J. J. SULLIVAN, Senior Adviser in Cattle Husbandry.

Your management will decide whether your dairy herd gets better or worse.

Taking the short view or the long view, you will not get the full benefit from your efforts unless your management is based on production records.

You are concerned with two aspects of herd production recording—(1) obtaining accurate records; (2) making the right use of the records obtained.

GET CORRECT RECORDS.

Are you in a Herd Recording Group? If so, do your bit towards getting accurate records. Don't boost the cows before the Herd Recorder arrives to get higher than average production. The true average is the figure that really concerns you.

MAKING USE OF RECORDS.

If your cows are being production recorded, you can use the herd recording reports in many ways to improve your herd and its production.

Check Husbandry Methods.

Compare your herd's average production with that of all herds in the group. If it is consistently below the average something is amiss. You are not being adequately rewarded for your work. Talk it over with your district officer of the Department of Agriculture and Stock. Talk it over with your neighbours. You will certainly get some pointers as to how your husbandry methods may be improved if they are at fault.

Check Your Cows.

Every cow in your herd is costing you money to keep. The profit you make depends on the net profit from each cow. In practically every herd there are odd cows that don't show a profit at all, and there are others that yield a very small profit indeed.

Don't think you have no cheaters competing for grass yet yielding little or no profit—they keep turning up in every herd.

Go through your production records sheet—it will show up the undesirables. You can turn them into cash there and then and never miss them. Their places will keep if you can't fill them immediately. After all, you are showing a profit on them for once.

Value of Feeding.

The feeding of supplements is one of the most critical matters that the dairy-farmer has to deal with. The balance between profit and loss can be very delicate. Individual cows respond differently to extra feed.

What to feed and how much to feed are puzzling questions. Only production records can give you the answers. To feed economically you must feed according to production.

Selection and Culling.

Herd Production records should be used in selecting breeders for herd replacements and in deciding what animals to cull.

To facilitate work with the herd, it is a good plan to divide it into three groups according to production—that is, high, medium and low. From the high group you will select your breeders, from the low group your

culls. The medium group will give you a little room for play.

Similarly, you can base your supplementary feeding on these three levels.

Selecting the Sire.

The sire is the most important single animal in the dairy herd. He is responsible for very many more of the herd replacements than any individual cow. His production qualities will determine your profits in 10 years' time.

It is vital that you get a sire that will be a herd improver. You can't do this without examining production records. These are published each year by the Department of Agriculture and Stock. By studying the records you can sort out the studs with a uniformly high average production and the strains and families that are responsible for this production.

This information will put you on the right track. Your sire can then be chosen according to the following figures:—

(1) The average production of the daughters of the sire and the grand-sire.

(2) The lactation records of the dam and the grand-dam.

(3) The production records of the cow families of the prospective sires.

These are the records that indicate the part the sire is likely to play in your herd. Provided the animal is well grown and obviously sound and healthy, you should base your selection on those records.

Finally, there is only one way in which you can be sure that you have made the right choice of a sire. You must see the production records of his daughters.

STUDYING AGRICULTURE IN THE UNITED STATES.

The Director of Agriculture in Queensland (Mr. W. J. S. Sloan) is to study at agricultural education and research centres in the United States and Hawaii for the next five and a half months.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) announced that Mr. Sloan has been awarded a travel grant from the Rockefeller Foundation.

On his tour, Mr. Sloan will study crop production methods, fodder conservation, soil conservation and pasture improvement under United States conditions. He will spend about six weeks in Texas, where there is a large belt of soils comparable with those on the Darling Downs.

He will also examine particularly the development of tobacco experiment stations and advisory services to tobacco growers. For this purpose he will spend about six weeks in North Carolina, an important tobacco growing State.

In these days of highly competitive markets, it is more necessary than ever to bring modern technical advances in farming to the primary producer without delay. For this reason, an important section of Mr. Sloan's tour will be spent studying the United States' system of providing advisory services for farmers.

With the expansion of irrigation in Queensland, it is felt that a more intensive irrigation advisory service is needed here. In the United States, Mr. Sloan will examine the operation of the irrigation advisory service on various irrigation areas.

Mr. Collins said that United States' experience will be drawn upon where it can be applied to agriculture in Queensland. The granting of special leave to Mr. Sloan is a further example of his Department's policy of encouraging and promoting overseas visits by specialist officers to examine, at first hand, farming practices that may be of benefit to this State.

Your Bull Should Run to Your Plan—Not His!

By L. A. WILLIS, Assistant Adviser in Cattle Husbandry.

The importance of the herd sire in a programme of herd improvement should need no emphasis. During his working life a bull will probably produce more than 10 times as many heifers as any cow in the herd.

Such an important animal must be adequately controlled and managed to ensure his most effective use. To achieve this, a secure bull paddock is essential.

An analysis of herd recording data in Queensland indicates that cows calving in the third quarter of the year produce substantially more milk and butterfat than cows calving at other times of the year. The average value of the difference in production obtained through seasonal calving at the most favourable time is £5 per cow per lactation. Even in small herds, the increased return obtained from seasonal calving would amply cover the cost of erecting a secure bull paddock, shelter shed, feed and water facilities and a service yard.

Mating.

Overworking a young bull can seriously reduce his vigour and fertility. A bull one year old, with reasonably spaced services, can be mated with 10-15 cows over a three-month period. A two-year-old bull may be mated with 20-25 over a three-month period. Bulls three years old and over may be mated with 40-50 cows over a three-month period.

Bulls worked in this manner may be profitably used till an old age. If a bull's progeny prove to be above herd average, he should be mated with only the very best producing cows after he reaches eight years of age. Such a policy will help maintain his vigour and fertility.

It has been established that conception rate is highest when cows are used in the latter half of the heat period. This knowledge can be applied when the bull is kept in a bull paddock and controlled mating is practised. If heat is first noted at the morning milking, it is best to allow service in the afternoon. Alternatively, when heat is noted at the afternoon milking, allow service the next morning.

Progeny Testing.

To avoid close inbreeding, a bull must be sold before his progeny are mated, unless a bull paddock is used. This results in many good bulls being sold before the production of their progeny is known. Purchasing a well bred bull every three years is an expensive proposition.

With a bull paddock, a young bull can be purchased for mating with the heifers and the original bull retained to be mated again with the adult cows. By this means, progeny testing can be carried out. When a really good sire is discovered, full use can be made of this valuable animal for many years.

Three factors are essential to practise progeny testing:—

1. A bull paddock.
2. Production records.
3. Accurate herd breeding records.

Disease Control.

The successful control of most diseases causing infertility depends largely on the complete sexual spelling

of the cows for a certain period. A bull paddock will help to control these diseases.

Control.

A bull should be halter broken as a calf. When about one year old a stout ring should be inserted in his nose. Always attach a strong staff to the nose ring when handling a bull.

The size of a bull paddock will depend on the types of pasture available. Even if it is intended to fully hand feed a bull, a paddock of at least one acre is desirable. This will allow sufficient space for the bull to obtain exercise.

A bull paddock should include a shelter shed, feeding and water facilities and a service yard. The paddock and yards must be strongly built to prevent any bulls breaking out. With such facilities a mature bull, even a vicious one, can be handled in safety. For safety reasons all bulls should be dehorned.

Without a bull paddock it is impossible to prevent a bull doing much needless work. Overwork can undermine a bull's vigour and fertility.

Adequate bull control has an important influence on the following farm aspects:—

1. Breeding programme.
2. Bull vigour and fertility through controlled matings.
3. Disease control.
4. Higher net income through seasonal calving.
5. Production improvement through progeny testing.
6. Personal safety.

SOLAR WATER HEATERS FOR DAIRY FARMS.

The adaptation of solar water heaters to supply hot water for washing dairy utensils may shortly become a practical proposition on Queensland farms, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said recently.

Modification of an original type of unit has just been completed with this object in view. From funds made available by the Commonwealth Dairy Industry Extension Grant, officers of his Department have modified a unit which is now ready for practical demonstration on a commercial dairy farm.

Mr. Collins said the completed unit has sufficient storage of hot water to provide for proper cleaning and sterilizing of dairy equipment twice daily.

Auxiliary heating from electric power is provided to ensure attainment of a temperature high enough for efficient cleaning and also to maintain continuity of supply on wet or dull days when there is little sunlight.

The completed unit will be installed on a farm on the Darling Downs, where its performance will be carefully observed. If satisfactory, consideration will then be given to further demonstrations to enable farmers in various dairying localities to have an opportunity of observing this form of heater in operation.

Solar energy, said Mr. Collins, may prove a cheap alternative source of heat for districts where dwindling wood supplies and high costs of electric power are involved. There is little doubt that solar energy could reduce the amount of fuel and electric power necessary for heating purposes, and as such solar water heaters warrant further investigation and demonstration in a State where ample sunlight is available.

If the unit is home-made, the initial capital outlay can be considerably reduced, and it has been estimated that a solar water heater will reduce the cost of providing the dairy's hot water supply by approximately 60 per cent.

The Use of Artificial Insemination in Poultry Breeding

By H. W. BURTON, Assistant Adviser, Poultry Branch.

Artificial insemination of poultry was first practised in the United States during the 1920's. With improved technique, it now plays a very important role in the breeding programme of most poultry rearing countries.

Because of the interest now being shown by Queensland poultry breeders in laying cages for recording individual egg production, it is anticipated that artificial insemination will become fairly widely used. Already one breeding farm is using artificial insemination exclusively, and most of the chickens hatched for experimental work at the Poultry Section of the Rocklea Animal Husbandry Research Farm are produced in this way.

WHAT ARE ITS ADVANTAGES?

The advantages of artificial insemination include the following:—

(1) Breeding in Laying Cages.

Laying cages present no problems where fertile eggs are required when artificial insemination is used. Selection of males may be carried out on the basis of egg production of their daughters or their sisters and those males having the highest family average used for subsequent breeding. Selected hens can then be inseminated and remain in these cages, and the pedigree of the fertile eggs is known.

(2) More Matings Possible.

The number of matings that can be made when running the males with the flock is limited. For example, in Australorps, with flock matings, 10–12 birds are normally mated to one male. However, in artificial insemination, one male can be used to fertilise 40 females per week.

(3) Use of Superior Old Males.

Older males that have been tested and found to be flock improvers may be kept for up to five years with good results. Under natural conditions, males are generally kept for only two years, or if kept longer than this period, they are mated with fewer hens to maintain fertility.

(4) Use of Injured Males.

Valuable male birds are sometimes injured accidentally and are of no further use under normal conditions. They can, however, be used to advantage with artificial insemination.

(5) No Favouritism.

Male birds have favourite hens and pay more attention to them than necessary while others are neglected. This is completely eliminated under artificial insemination.

(6) Cross Breeding Successful.

Although cross breeding is generally successful under natural conditions, there is a so-called colour bar and some hens will not mate with a male of a different colour. Obviously this bar is removed by using artificial insemination.

EQUIPMENT NEEDED.

The equipment needed is not lavish nor is it expensive. That needed for the collection of the semen is a number of graduated centrifuge tubes, plastic funnels, an eye dropper and a wooden rack for holding the centrifuge tubes.

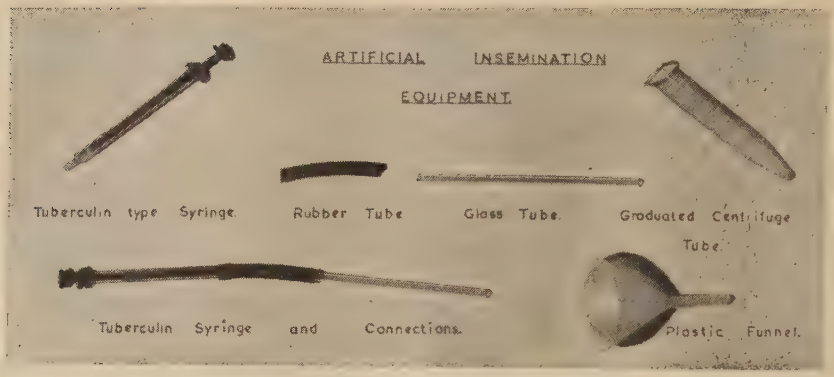

Plate 1.

Equipment Needed for Artificial Insemination.

For inseminating the hens, a syringe, glass tubes and a small piece of rubber tubing are all that is required. The complete equipment is illustrated in Plate 1.

The wooden rack is easily constructed and can be made of 3-ply. It is completely boxed with an extended back. The box rack is filled with cottonwool, into which the tubes are placed. The extended back can be used to identify the male bird from which the semen was obtained. Details of the construction are shown in Plate 2. This rack is used at the Poultry Section of the Rocklea Animal Husbandry Research Farm.

The graduated centrifuge tubes are of 15 c.c. (equal to 15 ml.) capacity, with a tapered end and lip at top and graduated to 10 c.c. in 0.1 c.c. divisions. These tubes measure the quantity of semen collected.

The plastic funnel (3⅜ in. size) is used to catch the semen, which then runs into the centrifuge tube. An eye dropper is used to transfer diluting fluid from a bottle into the centrifuge tubes containing the semen. The

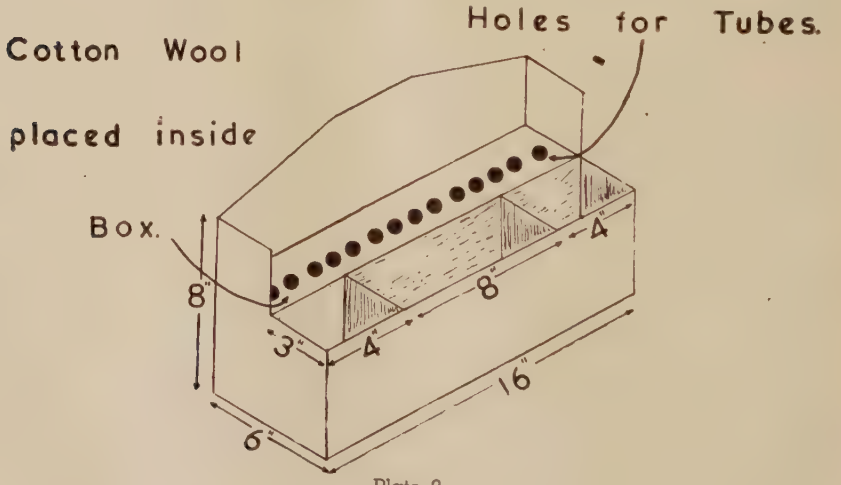

Plate 2.

Plan of a Bondwood Rack for Holding Tubes.

two are mixed in equal quantities in this tube by rotating the tube slowly; it should not be shaken.

The syringe of the type used for testing cattle for tuberculosis and quite often known as the dental type, is connected to a glass tube by means of a rubber tube. The syringe with connections is used to introduce the diluted semen into the oviduct of the hen.

The glass tubes are approximately 6 in. long, 3/16th in. in internal diameter and ¼ in. in external diameter. One tube is used for each hen and is sterilized after use. This lessens the chance of transmitting any infection from one bird to another.

The diluting solution, known as modified Ringer's solution, contains a number of chemicals which must be weighed accurately and filtered. The chemicals and the amounts used to make the solution are as follows:—

Sodium chloride ..	68 grams
Potassium chloride	17.33 grams
Calcium chloride ..	6.42 grams
Magnesium sulphate	2.50 grams
Sodium bicarbonate	24.50 grams
Distilled water ..	10,000 c.c.

Rather than go to the trouble and expense of preparing this solution, it would be better to buy it already prepared from a pharmaceutical chemist.

PREPARING THE MALE.

Best results are obtained when the male bird is placed on the floor and housed separately. It is most important that the bird can be caught quickly without exciting it unduly. Thus a suitable pen is required. At the Research Farm, the male birds are run in pens 3 ft. by 2 ft., with shavings for litter, and feed and water containers outside each pen. In one intensive shed, 14 ft. by 14 ft., 14 smaller pens have been built.

To make the collection of semen easier, the feathers around the vent should be clipped. It is important that the bird is free from any parasites, in particular fowl lice.

The male bird is handled for a few days until he quietens down and can be caught with a minimum of disturbance. Some birds only need handling once or twice, whilst others require to be handled up to 10 times to gain success.

The writer has found Australorps to give semen far more readily and in greater quantity than White Leghorns. Australorps give an average of 1 to 2 c.c. and White Leghorns ½ to 1 c.c.

The male birds should be "milked" several times before the semen is used for insemination, for the following reasons:—

(1) The spoiling of the semen by the male voiding droppings usually occurs during the first few times the bird is handled. A bird that persists in doing this should not be used any further.

(2) After males have not been "worked" for some time, the spermatoza in the semen lose their viability and are often misshapen.

(3) The amount of semen produced by each bird may be assessed. If the male bird refuses to give semen after 10 days of handling, then it is probably useless to persevere with it.

COLLECTING SEMEN.

For this operation, two persons are required, one for holding and one for collecting the semen. The holder rests the male bird's keel on the palm of his right hand so that the head is between the holder's side and elbow, the bird's legs being free to move. It is important to hold the male bird loosely to

Plate 3.
Massaging the Male Bird. Note that the feathers are clipped from around the vent.

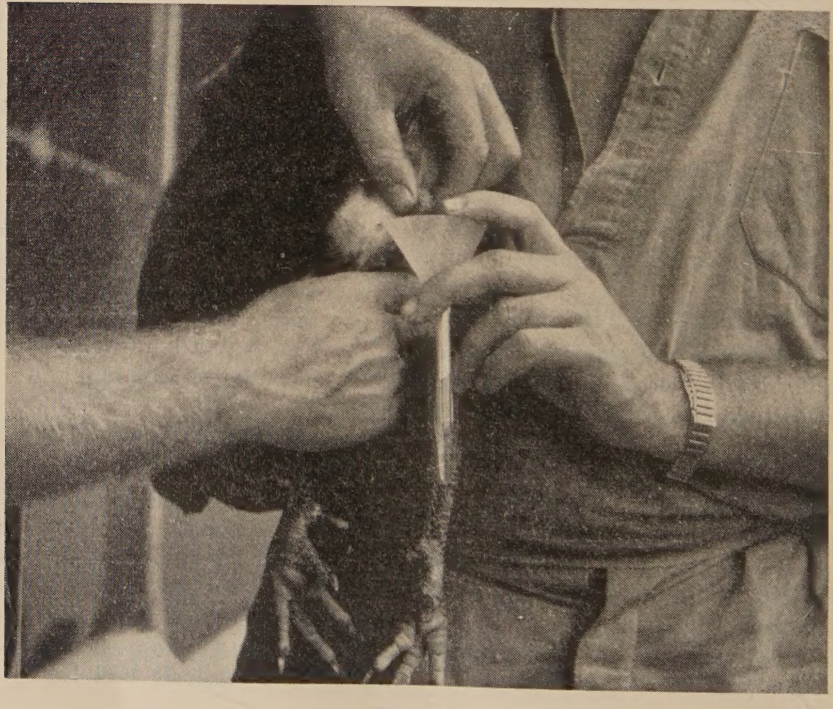

Plate 4.
Collecting the Semen.

gain the desired result. The holder's left hand is used to collect the semen with the plastic funnel.

The operator uses the technique of abdominal massage, which is a circular motion carried out by the thumb and fingers of the right hand in the region of the abdomen just under the pelvic bones (Plate 3). It must be stressed that quite a lot of pressure is applied during this circular motion. With the left hand, the operator holds the vent in such a way that the semen flows into the collecting funnel (Plate 4). The important thing is quickness in handling and massaging, for the operation of "milking" should be carried out within a minute or two. If the operator takes longer, the male may refuse to give semen.

INSEMINATING THE FEMALE.

The holder holds the female with head facing downwards, her back towards his body, using his left hand, which is placed under her breast. The right hand is placed over the vent so that the thumb is above the vent and forefinger below, as in Plate 5. A sudden pressure is exerted around the area and at the same time the thumb and forefinger are spread apart, thus causing the oviduct to be everted as is the case when laying (Plate 6). When the oviduct is sufficiently everted, the operator inserts the inseminating tube, which is connected to the syringe, as far as possible (usually about 1½ in.) down the oviduct. Pressure is then released by the holder and the operator injects the diluted semen. The cloaca is held around the glass inseminating tube as it is being removed, to prevent any of the diluted semen escaping from the oviduct.

Each hen is inseminated with 0.2 c.c. of diluted semen, which must not be more than two hours old.

Plate 5.

First Position of Fingers Around the Hen's Vent in Preparation for Insemination.

Plate 6.

Oviduct Everted by Applying Pressure Around the Vent.

Inseminations should be carried out twice the first week and then once each week thereafter while fertile eggs are required.

It is a good plan to carry out the operation at the same time each day, the best time being between 2 p.m. and 4 p.m. The reason for this is that during the morning most hens have an egg in the oviduct, thus obstructing the free passage of semen to the ovary. Another point in favour of inseminating the hens in the afternoon is that it is generally cooler and the hens are less likely to be affected by heat, particularly in late spring.

RESULTS.

During 1956, 10 males (5 White Leghorns and 5 Australorps) were used for artificial insemination at the Research Farm. A breeding flock of up to 200 hens was used on occasions for the production of day-old chickens as required. Altogether, 5,607 eggs fertilised by artificial insemination were set in the incubator and fertility of all artificially inseminated eggs was 93·3 per cent.